

2006 Buick Lucerne CXS

2006 ENGINE Engine Exhaust - Lucerne

2006 ENGINE**Engine Exhaust - Lucerne****SPECIFICATIONS****FASTENER TIGHTENING SPECIFICATIONS****Fastener Tightening Specifications**

Application	Specification	
	Metric	English
Catalytic Converter to Exhaust Manifold Nut (RPO L26)	40 N.m	30 lb ft
Engine Lift Bracket Bolt/Nut (RPO L26)	25 N.m	18 lb ft
Engine Mount to Frame Nut (RPO LD8)	80 N.m	59 lb ft
Exhaust Crossover Pipe Bolt/Stud (RPO L26)	18 N.m	13 lb ft
Exhaust Gas Recirculation (EGR) Inlet Pipe to Front Exhaust Manifold Pipe Nut (RPO LD8)	60 N.m	44 lb ft
Exhaust Gas Recirculation (EGR) Valve Adapter Pipe Bolt (RPO L26)	25 N.m	18 lb ft
Exhaust Hanger to Rear Suspension Support Bracket Bolt	30 N.m	22 lb ft
Exhaust Manifold Bolt (RPO LD8)	25 N.m	18 lb ft
Exhaust Manifold Bolt/Nut/Stud (RPO L26)	30 N.m	22 lb ft
Exhaust Manifold Heat Shield Bolt (RPO L26)	10 N.m	89 lb in
Exhaust Manifold Nut	25 N.m	18 lb ft
Frame Bolt (RPO LD8)	191 N.m	141 lb ft
Front Exhaust Manifold Pipe to Cylinder Head Stud (RPO LD8)	25 N.m	18 lb ft
Front Exhaust Manifold Pipe to Exhaust Manifold Bolt (RPO LD8)	25 N.m	18 lb ft
Front Exhaust Manifold Pipe to Lower Crankcase Bolt (RPO LD8)	25 N.m	18 lb ft
Heated Oxygen Sensor (HO2S) (RPO L26)	42 N.m	31 lb ft
Heated Oxygen Sensor (HO2S) (RPO LD8)	41 N.m	30 lb ft
Intermediate Shaft Pinch Bolt (RPO LD8)	45 N.m	33 lb ft
Muffler to Catalytic Converter Nut (RPO L26)	25 N.m	18 lb ft
Muffler to Rear Exhaust Manifold Pipe Nut (RPO LD8)	25 N.m	18 lb ft
Power Brake Booster Heat Shield Nut (RPO	20 N.m	15 lb ft

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Manifold to Rear Exhaust Manifold Pipe Nut (RPO LD8)	25 N.m	18 lb ft
Rear Exhaust Hanger Bracket to Rear Compartment Side Rail Bolt	50 N.m	37 lb ft
Rear Exhaust Hanger to Hanger Bracket Nut	30 N.m	22 lb ft
Rear Exhaust Manifold Pipe to Exhaust Manifold Bolt (RPO LD8)	40 N.m	30 lb ft
Rear Exhaust Manifold Pipe to Front Exhaust Manifold Pipe Bolt (RPO LD8)	25 N.m	18 lb ft
Sight Shield Bracket Nut (RPO L26)	30 N.m	22 lb ft
Steering Gear Heat Shield Bolt (RPO LD8)	9 N.m	80 lb in
Transaxle Mount to Frame Nut (RPO LD8)	50 N.m	37 lb ft

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC STARTING POINT - ENGINE EXHAUST

Begin the system diagnosis by reviewing the system Description and Operation. Reviewing the information will help you determine the correct symptom diagnostic procedure when a malfunction exists. It will also help you determine if the condition described by the customer is normal operation. Refer to **Symptoms - Engine Exhaust** in order to identify the correct procedure for diagnosing the system.

SYMPTOMS - ENGINE EXHAUST

- Review the Exhaust System Description and Operation in order to familiarize yourself with the system functions. Refer to **Exhaust System Description**.
- All diagnostics on a vehicle should follow a logical process. Strategy Based Diagnostics is a uniform approach for repairing all systems. The diagnostic flow is the place to start when repairs are necessary and may always be used in order to resolve a system problem. For a detailed explanation, refer to **Strategy Based Diagnosis**.

Visual/Physical Inspection

- Inspect for aftermarket or non-OEM devices such as, but not including; tailpipe extensions, headers and exhaust cutouts. This could affect the operation and proper performance of the exhaust system.
- Verify the exact operating conditions under which the concern exists. Note factors such as engine RPM, engine temperature, engine load and frequency of concern.
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause any symptom.

Intermittent

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Test the vehicle under the same conditions that the customer reported in order to verify the system is operating as designed.

Symptom List

Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:

- Loss of power-Refer to **Restricted Exhaust**.
- Poor acceleration-Refer to **Restricted Exhaust**.
- Poor fuel economy-Refer to **Restricted Exhaust**.
- Excessive smoke-diesel-Refer to **Restricted Exhaust**.
- Exhaust hissing noise-Refer to **Exhaust Leakage**.
- Exhaust popping noise-Refer to **Exhaust Leakage**.
- Exhaust rattle noise-Refer to **Exhaust Noise**.
- Loud exhaust noise-Refer to **Exhaust Noise**.
- Exhaust buzz, groan, hum noise-Refer to **Exhaust Noise**.

RESTRICTED EXHAUST

Diagnostic Aids

CAUTION: Refer to HOT EXHAUST SYSTEM CAUTION .

For dual exhaust systems a quick check of exhaust flow will help determine which side of the exhaust system is restricted. The side that has less exhaust flow is the side that will be suspect and diagnosis should begin there.

Test Description

4: The exhaust system has very low back pressure under normal conditions. If the exhaust system is restricted, a significant increase in the exhaust pressure is noticed on the **J 35314-A** Exhaust Back Pressure Gage. See **Special Tools**. Removing the heated oxygen sensor (HO2S) may set a diagnostic trouble code (DTC). When finishing this diagnostic table, be sure to clear all codes.

5: This step will isolate the catalytic converter from the remainder of the exhaust system.

Restricted Exhaust

Step	Action	Value(s)	Yes	No
1	Did you verify the customers complaint?	-	Go to Step 2	-

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Step	Did you review Action Exhaust	Value(s)	Yes	Go to No
2	Did you verify the customer's complaint and perform the necessary inspections?	-	Go to Step 3	Symptoms - Engine - Exhaust
3	Is the system equipped with dual exhaust?	-	Go to Diagnostic Aids	Go to Step 4
4	<ol style="list-style-type: none"> 1. Remove the pre-catalyst heated oxygen sensor (HO2S). Refer to <u>Heated Oxygen Sensor Replacement - Bank 1 Sensor 1</u> or <u>Heated Oxygen Sensor Replacement - Bank 2 Sensor 1</u>. 2. Install the J 35314-A Exhaust Back Pressure Gage in place of the HO2S. See <u>Special Tools</u>. 3. Start the engine. 4. Increase and monitor the engine speed at 2,500 RPM. 5. Observe the exhaust system back pressure reading on the gage. <p>Does the reading exceed the specified value?</p>	9 kPa (1.25 psi)	Go to Step 5	Go to Step 8
5	<ol style="list-style-type: none"> 1. Turn the engine off and place the ignition in the lock position. 2. Remove the J 35314-A. See <u>Special Tools</u>. 3. Re-install the pre-catalyst HO2S sensor. Refer to <u>Heated Oxygen Sensor Replacement - Bank 1 Sensor 1</u> or <u>Heated Oxygen Sensor Replacement - Bank 2 Sensor 1</u>. 4. Remove the post-catalyst HO2S sensor. Refer to <u>Heated</u> 	9 kPa (1.25		

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	<p><u>Oxygen Sensor Replacement - Bank 1 Sensor 2</u></p> <ol style="list-style-type: none"> Install the J 35314-A . See <u>Special Tools</u>. Start the engine. Increase and monitor the engine speed at 2500 RPM. Observe the exhaust system back pressure reading on the gage. <p>Does the reading exceed the specified value?</p>	psi)		
			Go to Step 6	Go to Step 7
6	<p>Inspect the exhaust system for the following conditions:</p> <ul style="list-style-type: none"> • Damage in the exhaust pipe • Debris in the exhaust pipe • Muffler or resonator, if equipped, internal failure • Two-layer exhaust pipe separation <p>Did you find and correct the condition?</p>	-	Go to Step 8	-
7	<p>Replace the exhaust system. Refer to <u>Exhaust System Replacement (RPO L26)</u> or <u>Exhaust System Replacement (RPO LD8)</u></p> <p>Did you find and correct the condition?</p> <ol style="list-style-type: none"> Remove the J 35314-A . See <u>Special Tools</u>. Reinstall the applicable HO2S sensor. Refer to one of the following: <ul style="list-style-type: none"> • <u>Heated Oxygen Sensor Replacement - Bank 1 Sensor 1</u> 	-	Go to Step 8	-

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7	<p>Replace the exhaust system. Refer to <u>Exhaust System Replacement - Bank 1 Sensor 1</u> or <u>Exhaust System Replacement (RPO L26)</u> or <u>Exhaust System Replacement (RPO L26)</u>.</p> <p>• <u>Heated Oxygen Sensor Replacement - Bank 1 Sensor 1</u></p>	-	Go to Step 8	-
8	<p>• <u>Heated Oxygen Sensor Replacement - Bank 2 Sensor 1</u></p> <p>3. Clear any codes.</p> <p>4. Road test the vehicle in order to verify the repair.</p> <p>Did you correct the condition?</p>	-	System OK	Go to Step 2

EXHAUST LEAKAGE

Exhaust Leakage

Condition	Action
<p>CAUTION: Refer to <u>HOT EXHAUST SYSTEM CAUTION</u> .</p> <p>DEFINITION: An exhaust leak may show stains at the area of the leak. The leak may be felt by holding a hand close to the suspected areas or using a smoke pencil. The leak may make a popping or hissing noise. Refer to <u>Symptoms - Engine Exhaust</u> prior to beginning this table.</p>	
<p>Misaligned or improperly installed exhaust system components</p> <p>Exhaust leaks at the following connections:</p> <ul style="list-style-type: none"> Exhaust manifold to pipe Flanges Pipe clamps <p>Seals or gaskets leaking;</p> <ul style="list-style-type: none"> Exhaust manifold to cylinder head 	<ul style="list-style-type: none"> Align and tighten the exhaust system components to the specifications. Refer to <u>Fastener Tightening Specifications</u>. Ensure the exhaust hangers are in the proper locations and not loose. Refer to <u>Exhaust System Insulator, Hanger, Bracket Replacement</u>. <p>Tighten the components to the specifications. Refer to <u>Fastener Tightening Specifications</u>.</p> <p>Replace the leaking seal or gasket. Refer to the affected components procedure for service.</p>

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<ul style="list-style-type: none"> Exhaust pipes to exhaust manifold Catalytic converter connection 	<p>Align and tighten the exhaust system components to the specifications.</p> <ul style="list-style-type: none"> Refer to <u>Fastener Tightening Specifications</u>. Ensure the exhaust hangers are in the proper locations and
<p>Exhaust leaks at the following connections:</p> <ul style="list-style-type: none"> EGR connections AIR connections to the exhaust manifold or cylinder head Exhaust manifold to pipe 	<p>Tighten the components to the specifications. Refer to <u>Fastener Tightening Specifications</u>.</p>
<p>Irregularities at the mating surfaces on the flange connections</p> <ul style="list-style-type: none"> Flanges Pipe clamps 	<p>Repair as required or replace the affected component. Refer to the affected components procedure for service.</p>
Exhaust manifold cracked or broken	<p>Replace the exhaust manifold. Refer to <u>Exhaust Manifold Replacement - Left Side (RPO L26)</u>, <u>Exhaust Manifold Replacement - Left Side (RPO LD8)</u>, <u>Exhaust Manifold Replacement - Right Side (RPO L26)</u> or <u>Exhaust Manifold Replacement - Right Side (RPO LD8)</u>.</p>
Exhaust system component connection welds leaking	<p>Replace the leaking component. Refer to the affected component's procedure for service.</p>
Muffler or resonator, if equipped, damaged or leaking at the seams	<p>Replace the affected muffler or resonator, if equipped. Refer to <u>Exhaust System Replacement (RPO L26)</u> or <u>Exhaust System Replacement (RPO LD8)</u>.</p>

EXHAUST NOISE

Exhaust Noise

Condition	Action
<p>CAUTION: Refer to <u>HOT EXHAUST SYSTEM CAUTION</u> .</p> <p>DEFINITION: An audible or physical noise due to a faulty component or damaged components causing a loose or misaligned exhaust system resulting in a rattle or vibration noise - buzz, groan, hum. Refer to <u>Symptoms - Engine Exhaust</u> prior to beginning this table.</p>	
<p>Popping or hissing noise</p> <p>Loud exhaust</p>	<p>Exhaust leak - Refer to <u>Exhaust Leakage</u>.</p> <ol style="list-style-type: none"> Compare to a known good vehicle. Inspect for a damaged or failed muffler or resonator, if equipped. Replace the faulty muffler or resonator, if equipped. Refer to <u>Exhaust System Replacement (RPO L26)</u>

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Condition	or <u>Exhaust System Replacement (RPO LD8).</u>
Caution: Rattle or vibration Refer to HOT EXHAUST SYSTEM CAUTION	1. Inspect for a bent or loose hanger, loose heat shield or loose clamp. 2. Inspect for a exhaust pipe causing interference. 3. Repair or replace the affected component. Refer to the affected component's service procedure.
DEFINITION: An audible or physical noise due to a faulty component or damaged components causing a loose or misaligned exhaust system resulting in a rattle or vibration noise - buzz, groan, hum. Refer to <u>Symptoms - Engine Exhaust</u> prior to beginning this table.	1. Test the components by tapping with a rubber mallet
Internal rattle	1. Test the components by tapping with a rubber mallet
Popping or hissing noise	<u>Exhaust Leak - Rattle Exhaust Leakage.</u>
	2. Replace the faulty catalytic converter, resonator, if equipped or muffler. Refer to <u>Exhaust System Replacement (RPO L26)</u> or <u>Exhaust System Replacement (RPO LD8).</u>

REPAIR INSTRUCTIONS

EXHAUST MANIFOLD REPLACEMENT - LEFT SIDE (RPO L26)

Removal Procedure

CAUTION: Refer to EXHAUST SERVICE CAUTION .

CAUTION: Refer to PROTECTIVE GOGGLES AND GLOVE CAUTION .

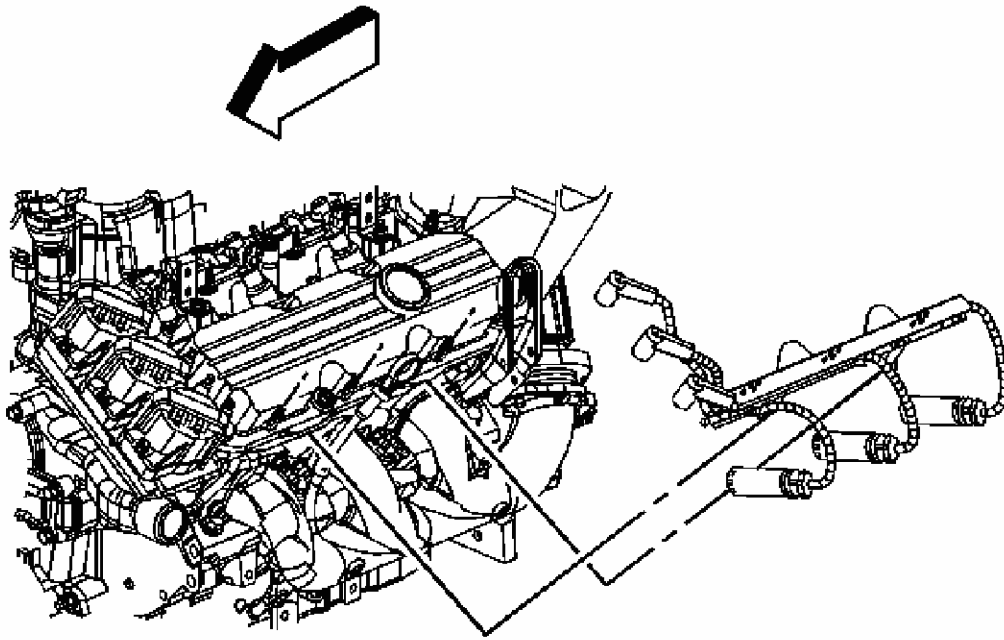


Fig. 1: View Of Left Exhaust Manifold (RPO L26)
Courtesy of GENERAL MOTORS CORP.

1. Remove the oil level indicator and tube. Refer to **Oil Level Indicator and Tube Replacement** .
2. Disconnect the spark plug wires from the spark plugs.
3. Remove the spark plug wire channel from the rocker cover.

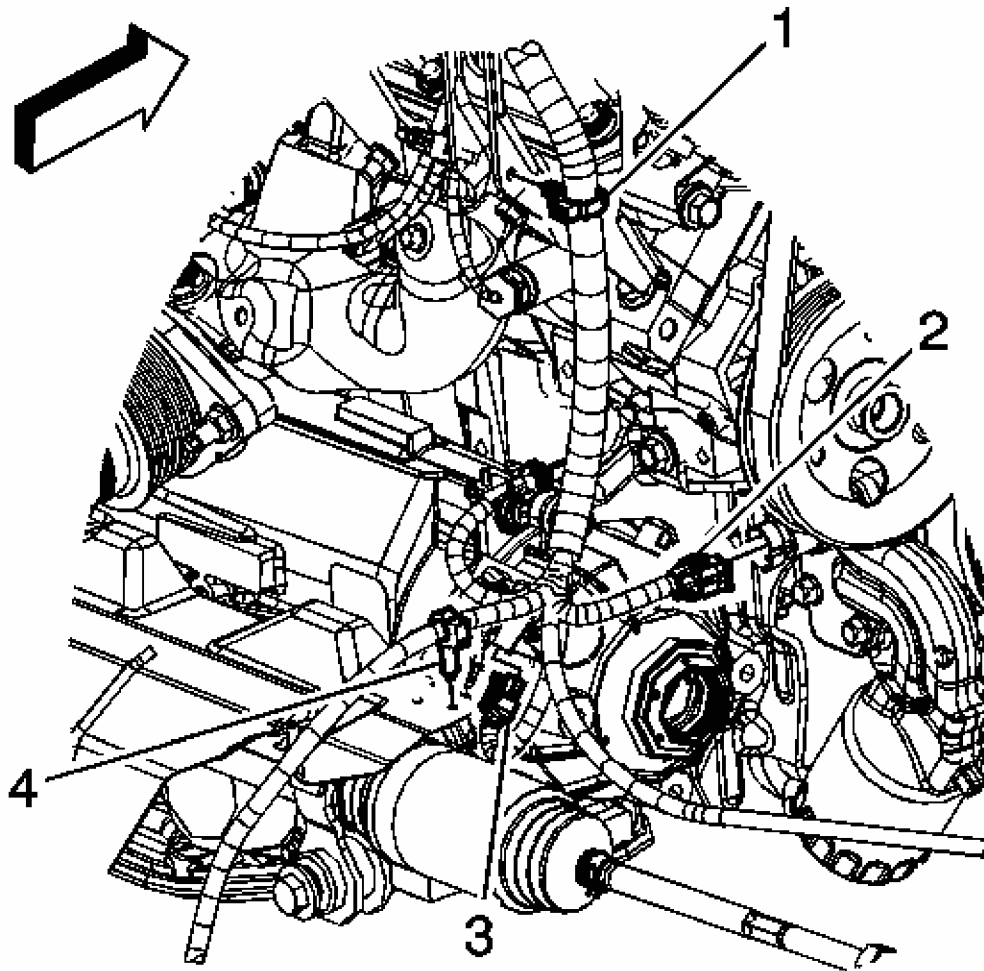


Fig. 2: View Of Left side Engine Compartment Components
Courtesy of GENERAL MOTORS CORP.

4. Remove the engine harness clip (1) from the engine lift bracket.

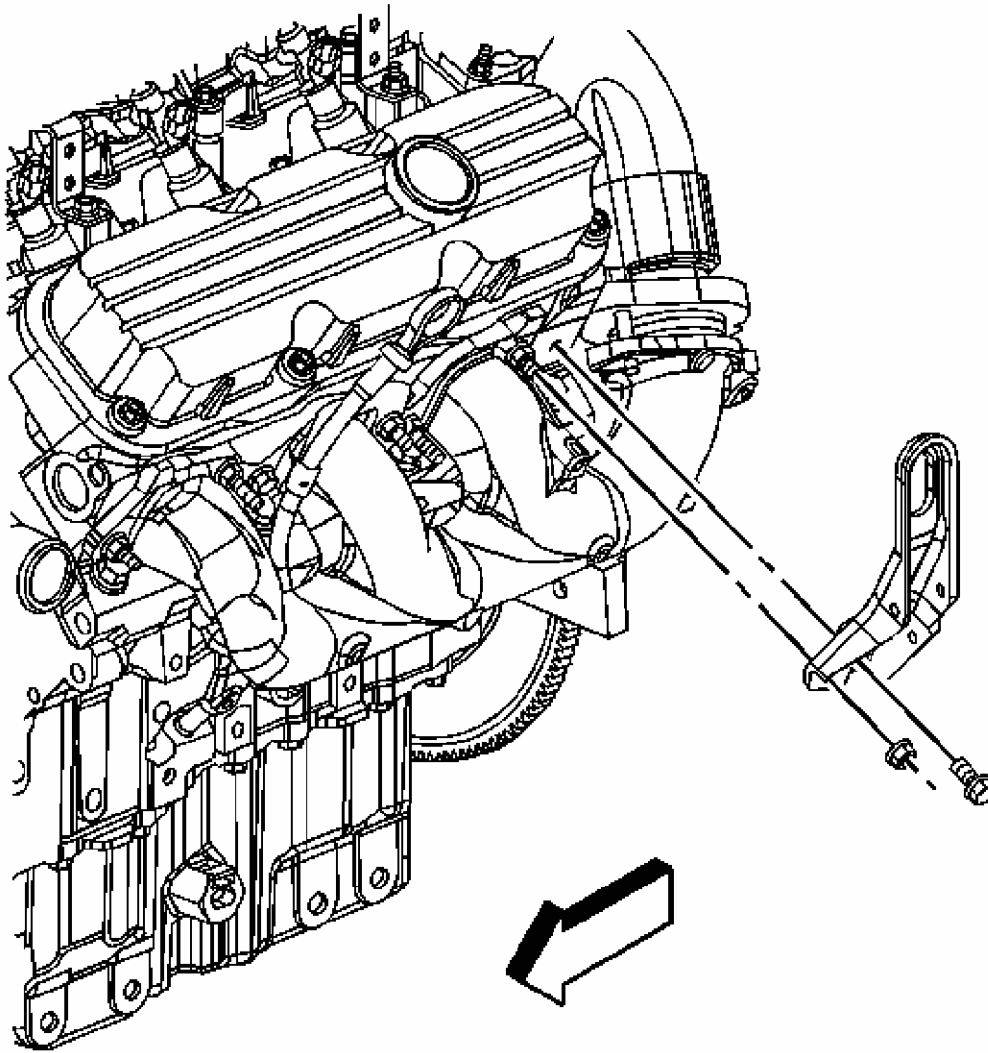


Fig. 3: Identifying Engine Lift Bracket Bolt & Nut
Courtesy of GENERAL MOTORS CORP.

5. Remove the engine lift bracket bolt and nut.
6. Remove the engine lift bracket.

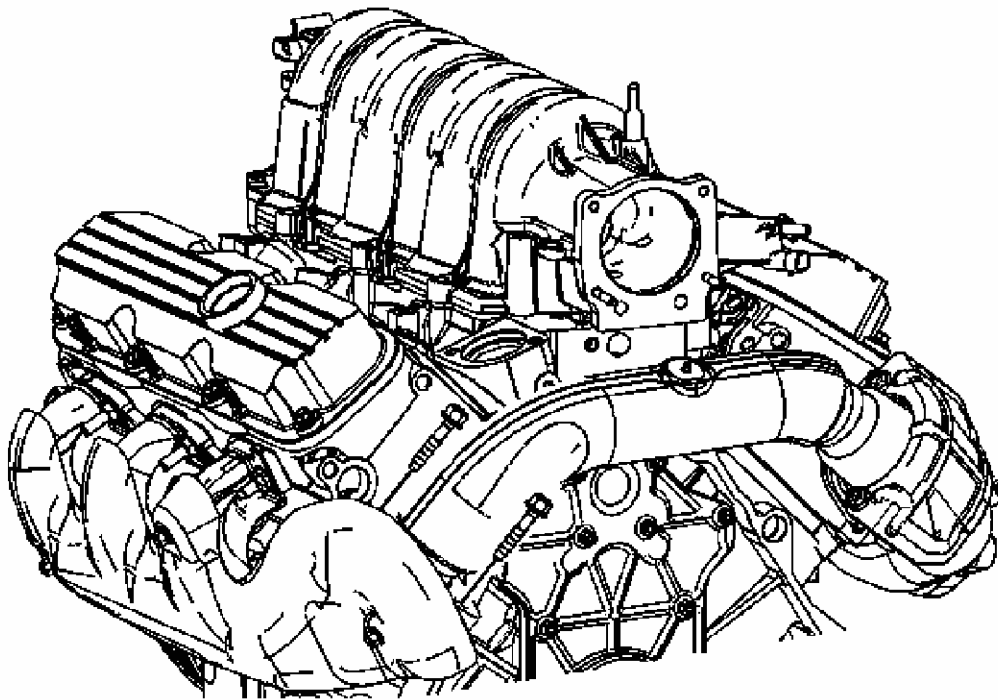


Fig. 4: Identifying Exhaust Crossover Pipe
Courtesy of GENERAL MOTORS CORP.

7. Remove the 2 bolts attaching the exhaust crossover to the left exhaust manifold.

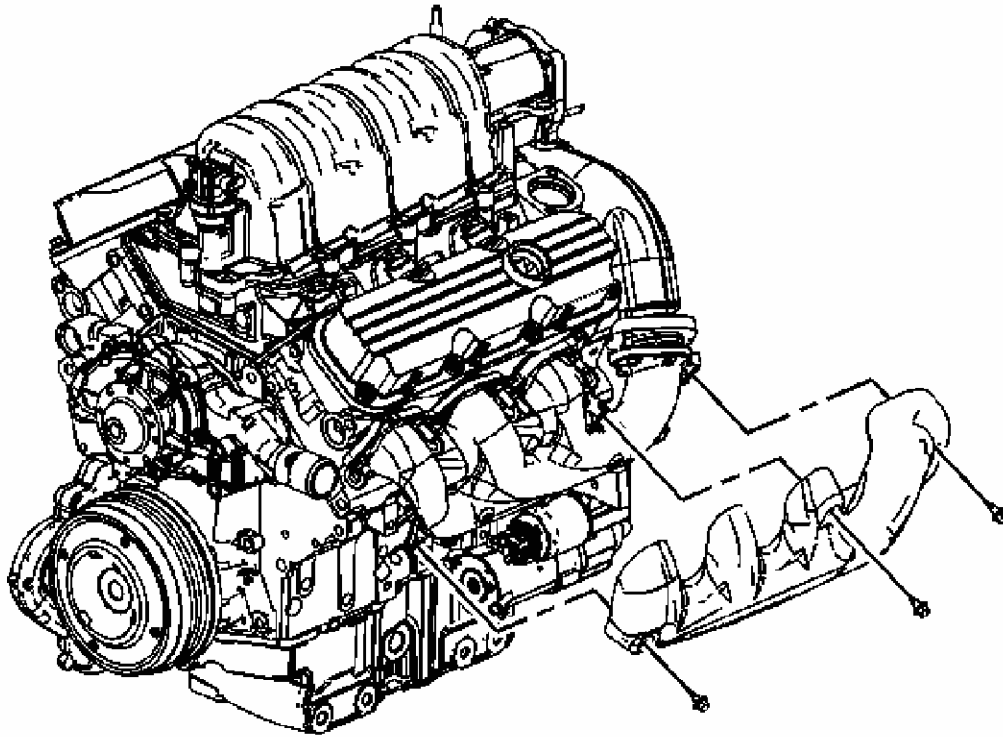


Fig. 5: Removing/Installing Left Exhaust Manifold Heat Shield & Bolts
Courtesy of GENERAL MOTORS CORP.

8. Remove the exhaust manifold heat shield bolts and shield.

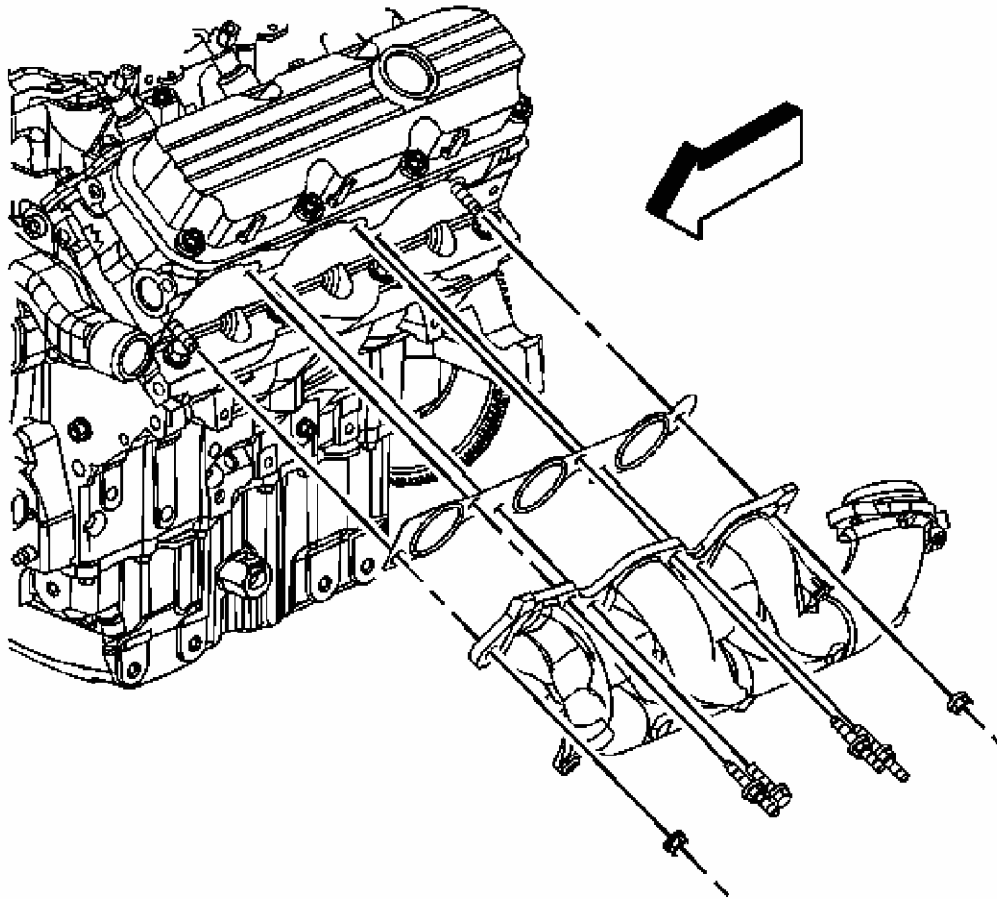


Fig. 6: Removing/Installing Left Exhaust Manifold & Gasket
Courtesy of GENERAL MOTORS CORP.

9. Remove the exhaust manifold bolt, studs and nuts.
10. Remove the exhaust manifold.
11. Remove and discard the exhaust manifold gasket.

Installation Procedure

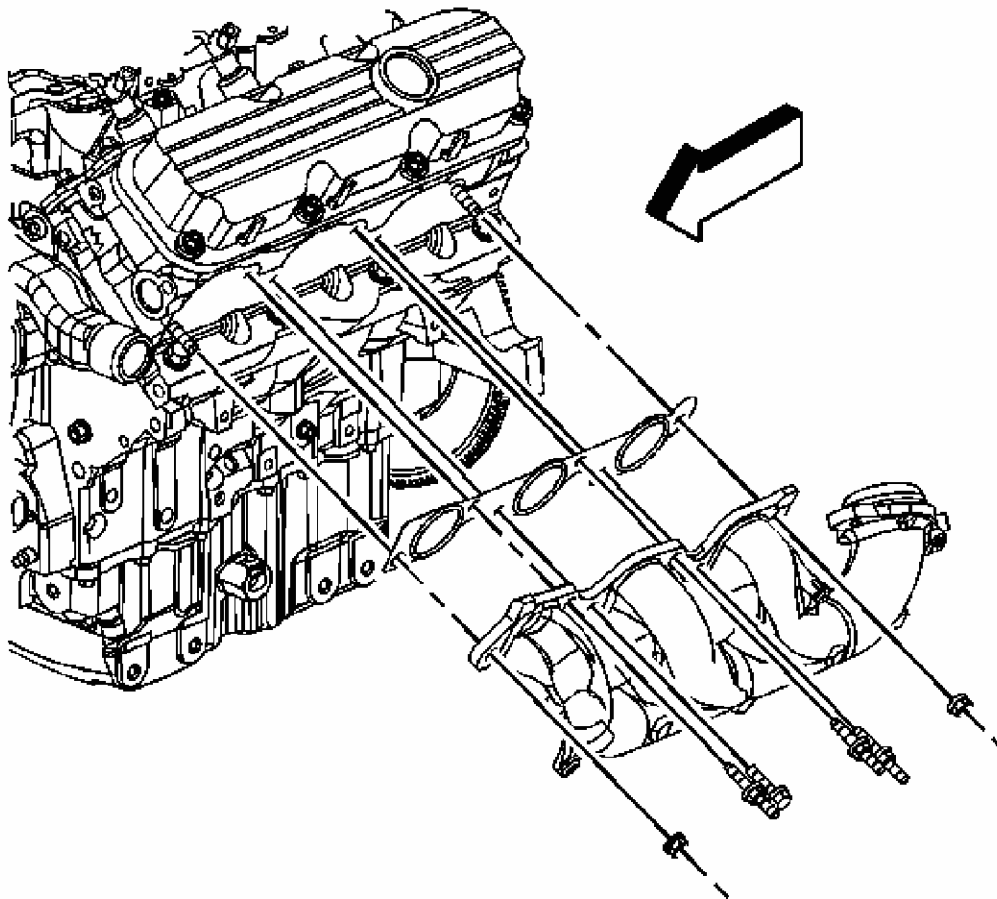


Fig. 7: Removing/Installing Left Exhaust Manifold & Gasket
Courtesy of GENERAL MOTORS CORP.

1. Install a NEW exhaust manifold gasket onto the studs.
2. Install the exhaust manifold.

NOTE: Refer to Fastener Notice .

3. Install the exhaust manifold nuts, studs and bolt.

Tighten: Tighten the bolt, studs and nuts to 30 N.m (22 lb ft).

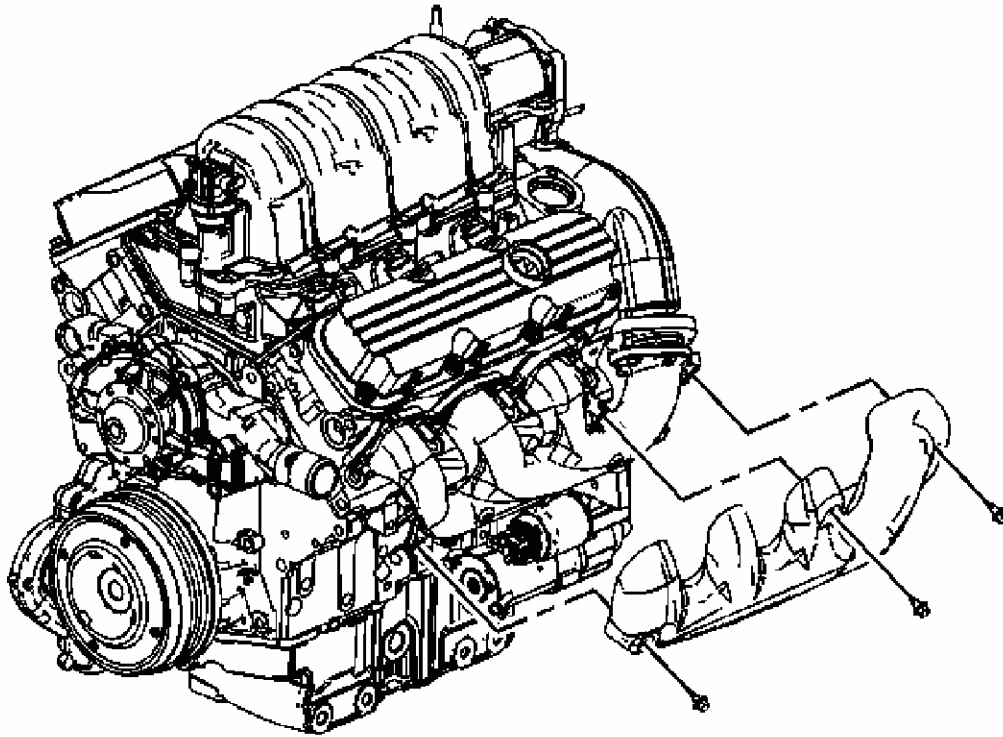


Fig. 8: Removing/Installing Left Exhaust Manifold Heat Shield & Bolts
Courtesy of GENERAL MOTORS CORP.

4. Position the exhaust manifold heat shield to the manifold.
5. Install the exhaust manifold heat shield bolts.

Tighten: Tighten the bolts to 10 N.m (89 lb in).

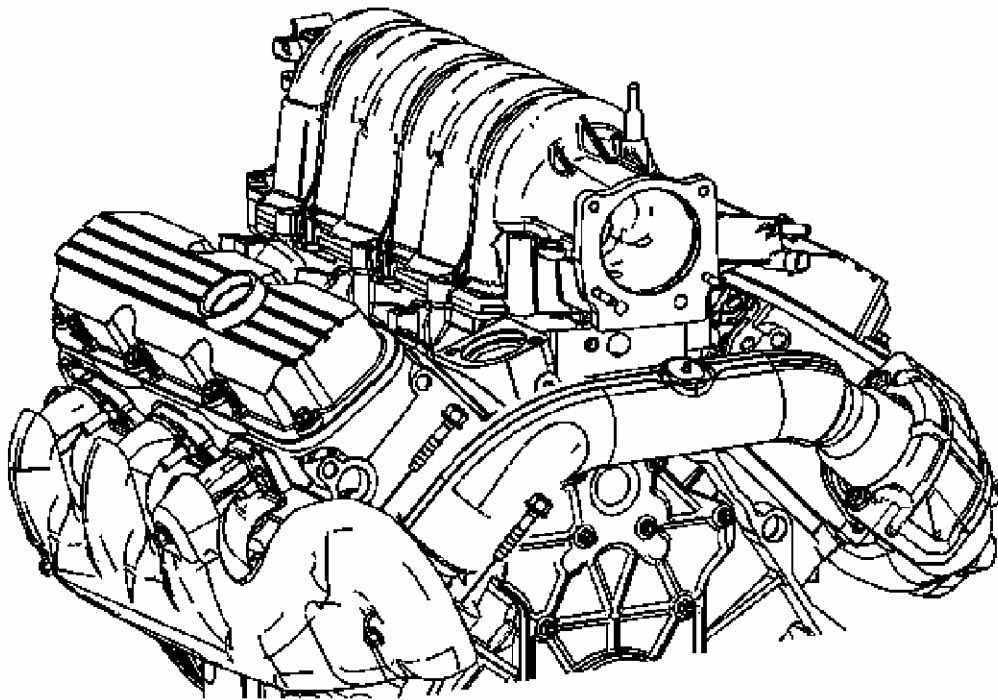


Fig. 9: Identifying Exhaust Crossover Pipe
Courtesy of GENERAL MOTORS CORP.

6. Install the 2 bolts attaching the exhaust crossover to the left exhaust manifold.

Tighten: Tighten the bolts to 18 N.m (13 lb ft).

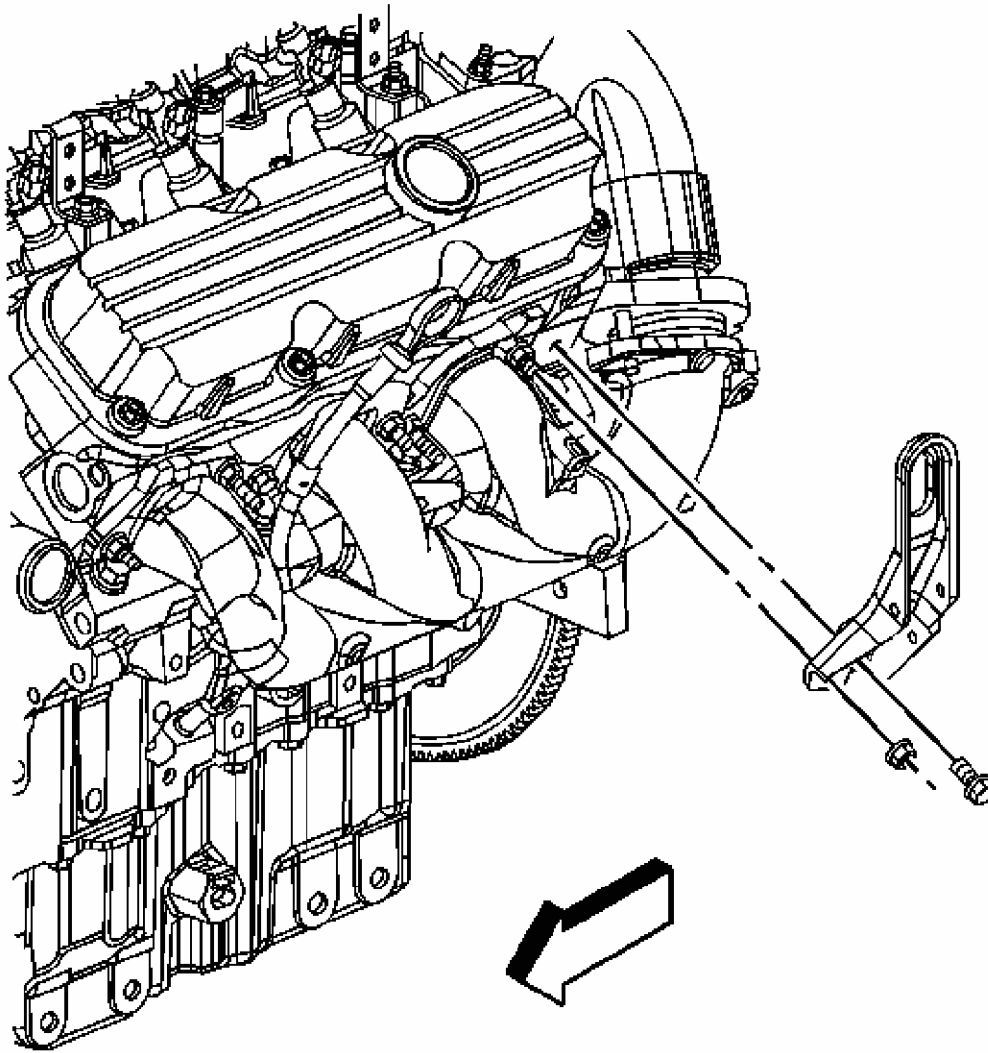


Fig. 10: Identifying Engine Lift Bracket Bolt & Nut
Courtesy of GENERAL MOTORS CORP.

7. Install the engine lift bracket.
8. Install the engine lift bracket bolt and nut.

Tighten: Tighten the bolt/nut to 25 N.m (18 lb ft).

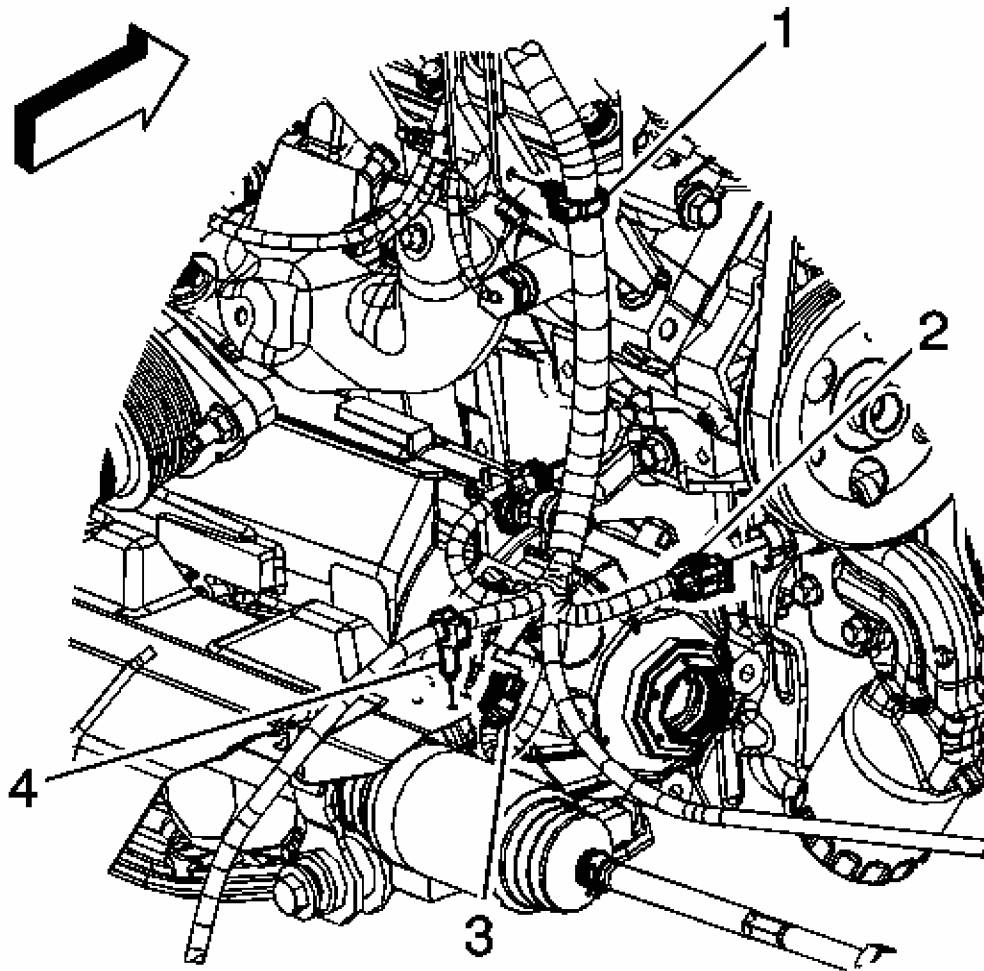


Fig. 11: View Of Left side Engine Compartment Components
Courtesy of GENERAL MOTORS CORP.

9. Install the engine harness clip (1) to the engine lift bracket.

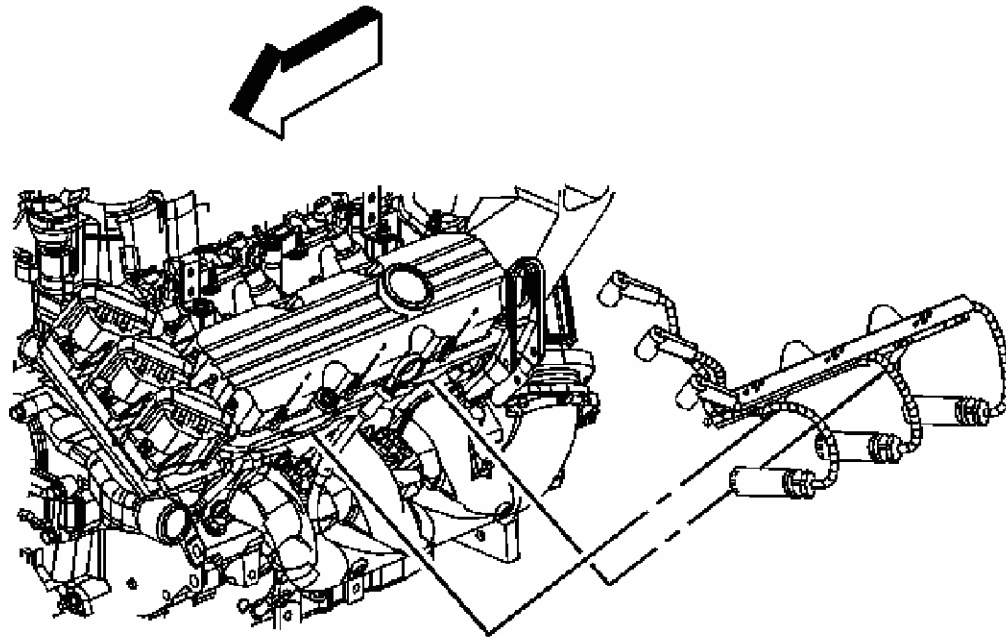


Fig. 12: View Of Left Exhaust Manifold (RPO L26)
Courtesy of GENERAL MOTORS CORP.

10. Install the spark plug wire channel to the rocker cover.
11. Connect the spark plug wires to the spark plugs.
12. Install the oil level indicator and tube. Refer to **Oil Level Indicator and Tube Replacement** .

EXHAUST MANIFOLD REPLACEMENT - LEFT SIDE (RPO LD8)

Removal Procedure

CAUTION: Refer to **EXHAUST SERVICE CAUTION** .

CAUTION: Refer to **PROTECTIVE GOGGLES AND GLOVE CAUTION** .

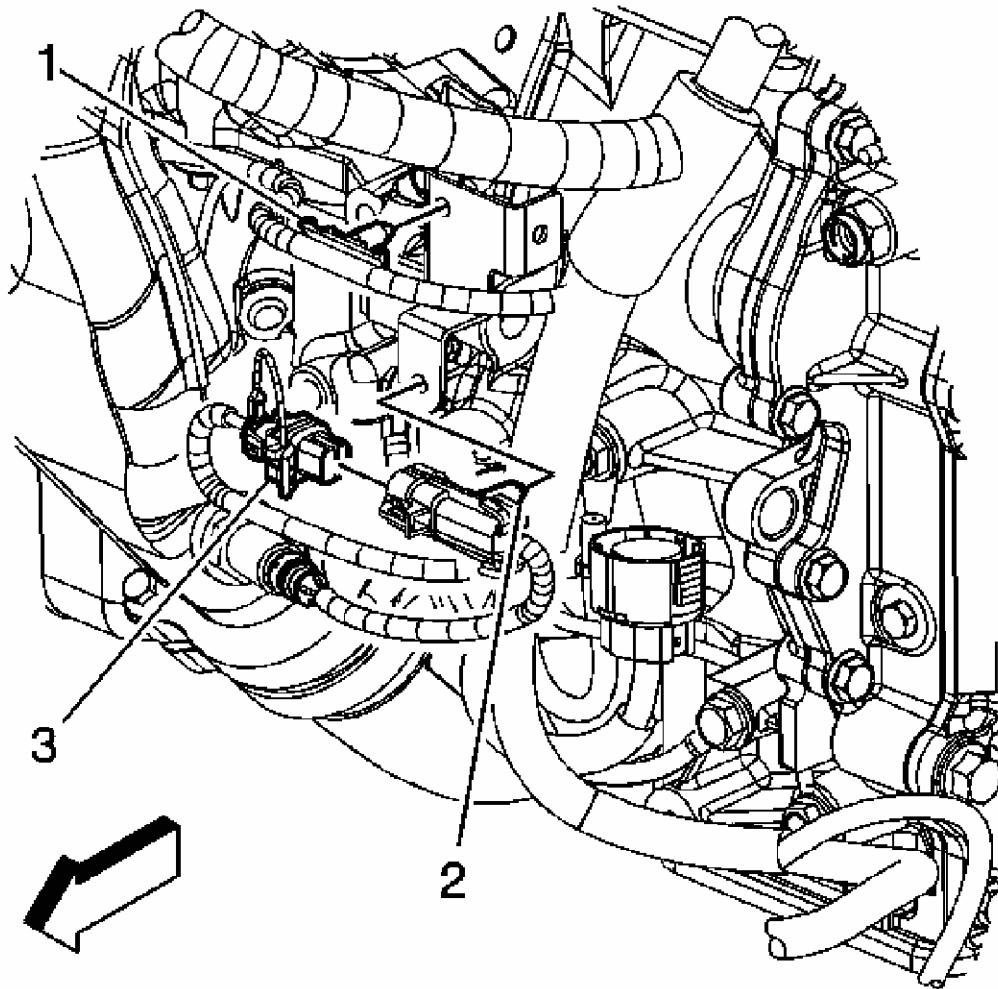


Fig. 13: View Of Engine Harness Electrical Connector & Clips
Courtesy of GENERAL MOTORS CORP.

1. Remove the front engine mount bracket. Refer to **Engine Front Mount Bracket Replacement** .
2. Remove the connector position assurance (CPA) retainer.
3. Disconnect the engine harness electrical connector (3) from the heated oxygen sensor (HO2S).

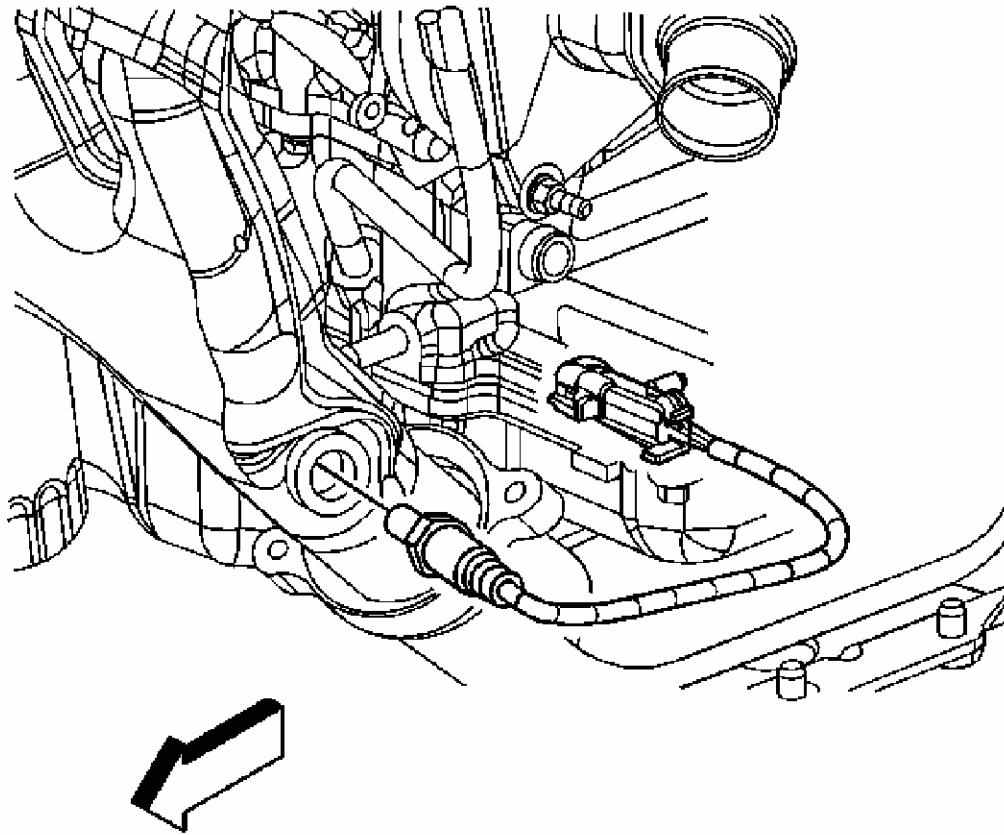


Fig. 14: Locating HO2S Wiring Harness Connector
Courtesy of GENERAL MOTORS CORP.

4. Remove the HO2S.

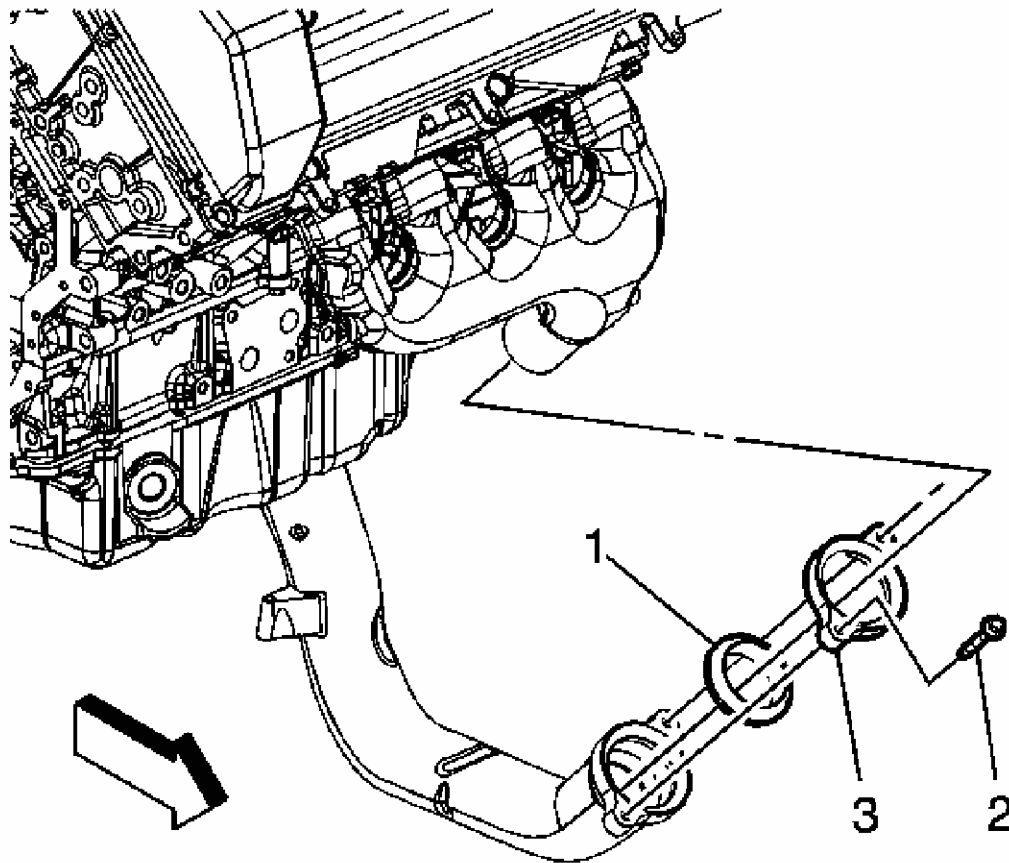


Fig. 15: Identifying Exhaust Manifold Front Pipe Bolts
Courtesy of GENERAL MOTORS CORP.

5. Remove the exhaust manifold front pipe bolts (2).

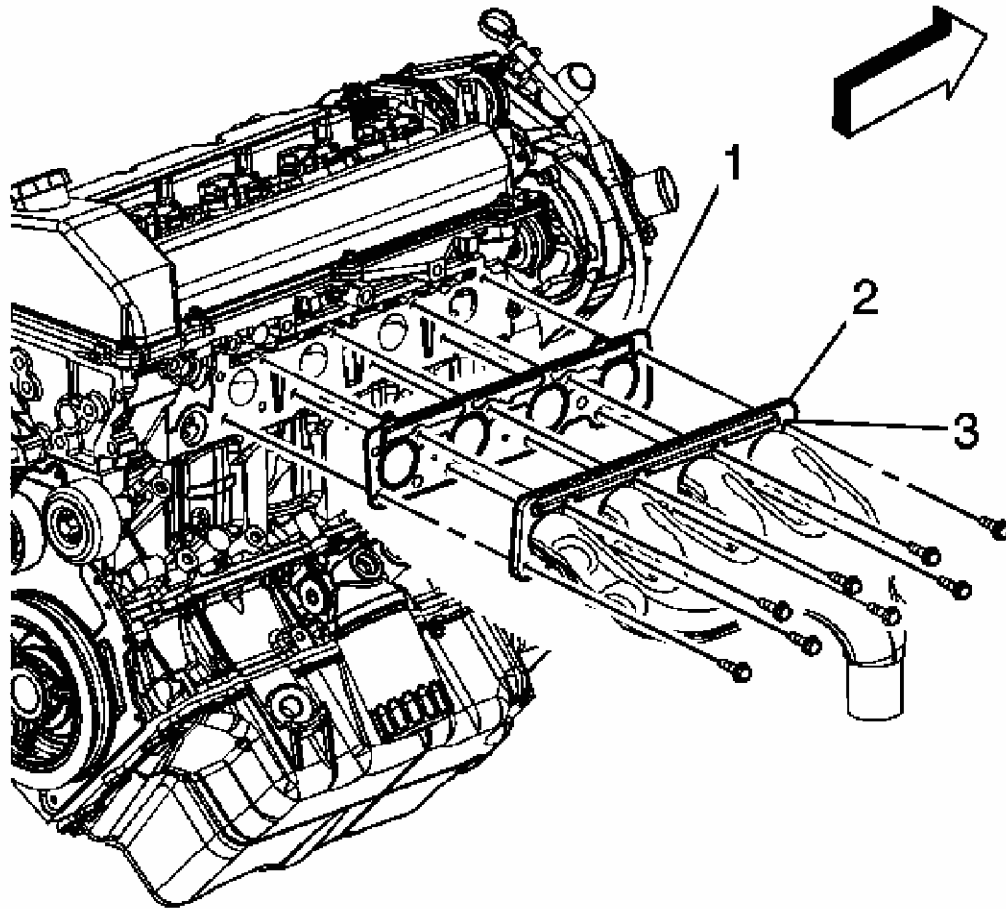


Fig. 16: View Of Front Exhaust Manifold Pipe Flange & Seal
Courtesy of GENERAL MOTORS CORP.

6. Remove the exhaust manifold bolts.
7. Remove the exhaust manifold (2).
8. Remove and discard the exhaust manifold gasket (1).
9. Remove and discard the front exhaust manifold pipe seal.
10. Remove the front exhaust manifold pipe flange.

Installation Procedure

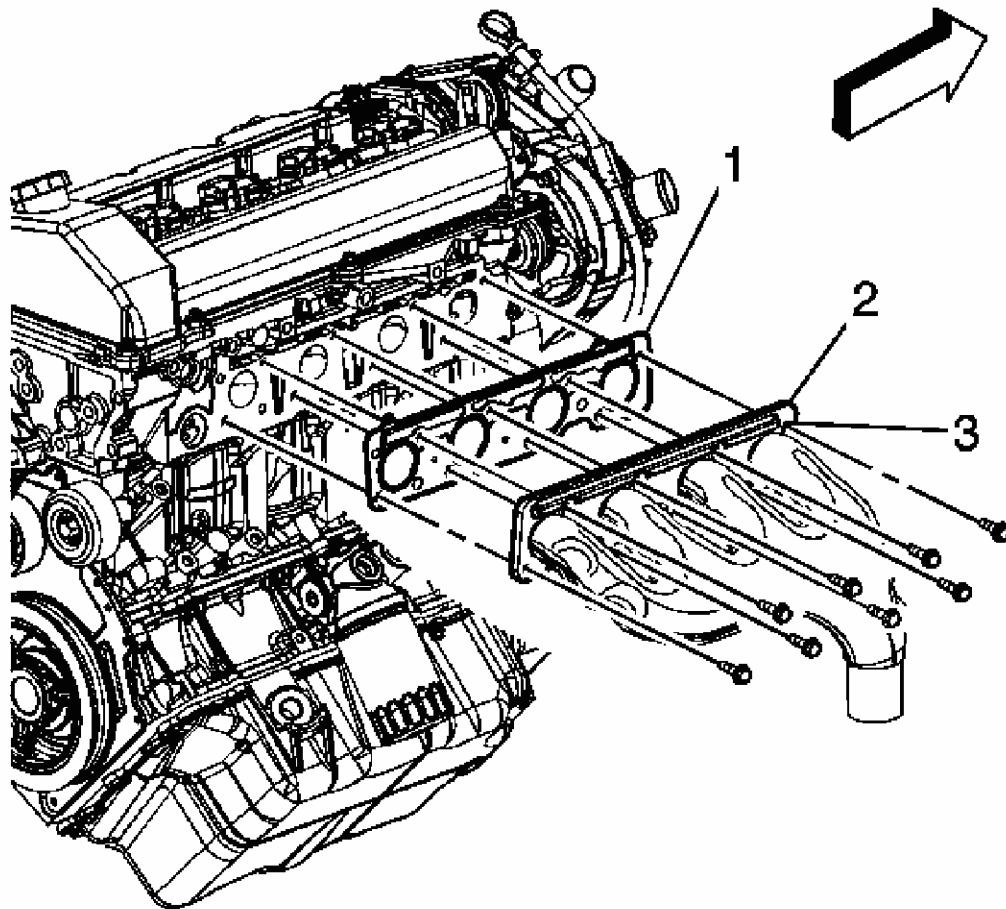


Fig. 17: View Of Front Exhaust Manifold Pipe Flange & Seal
Courtesy of GENERAL MOTORS CORP.

1. Install the front exhaust manifold pipe flange and a NEW seal onto the exhaust manifold.
2. Insert the upper right exhaust manifold bolt to the manifold in this location (2).
3. Place the NEW exhaust manifold gasket over the bolt and against the manifold.
4. Insert the exhaust manifold into the front exhaust manifold pipe and against the cylinder head.
5. Finger start the exhaust manifold bolt.

NOTE: Refer to Fastener Notice .

6. Install the remaining exhaust manifold bolts and tighten all exhaust manifold bolts starting from right to left beginning with the bolt in this location (2).

Tighten: Tighten the bolts to 25 N.m (18 lb ft).

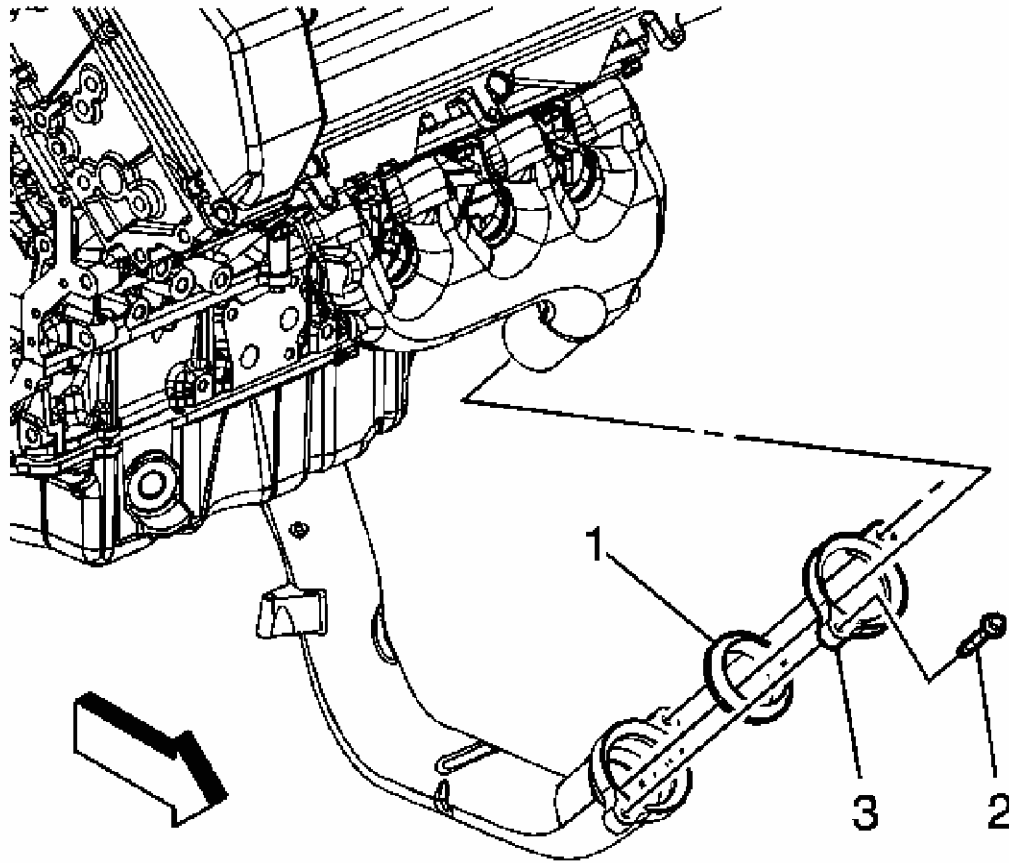


Fig. 18: Identifying Exhaust Manifold Front Pipe Bolts
Courtesy of GENERAL MOTORS CORP.

7. Install the exhaust manifold front pipe bolts (2).

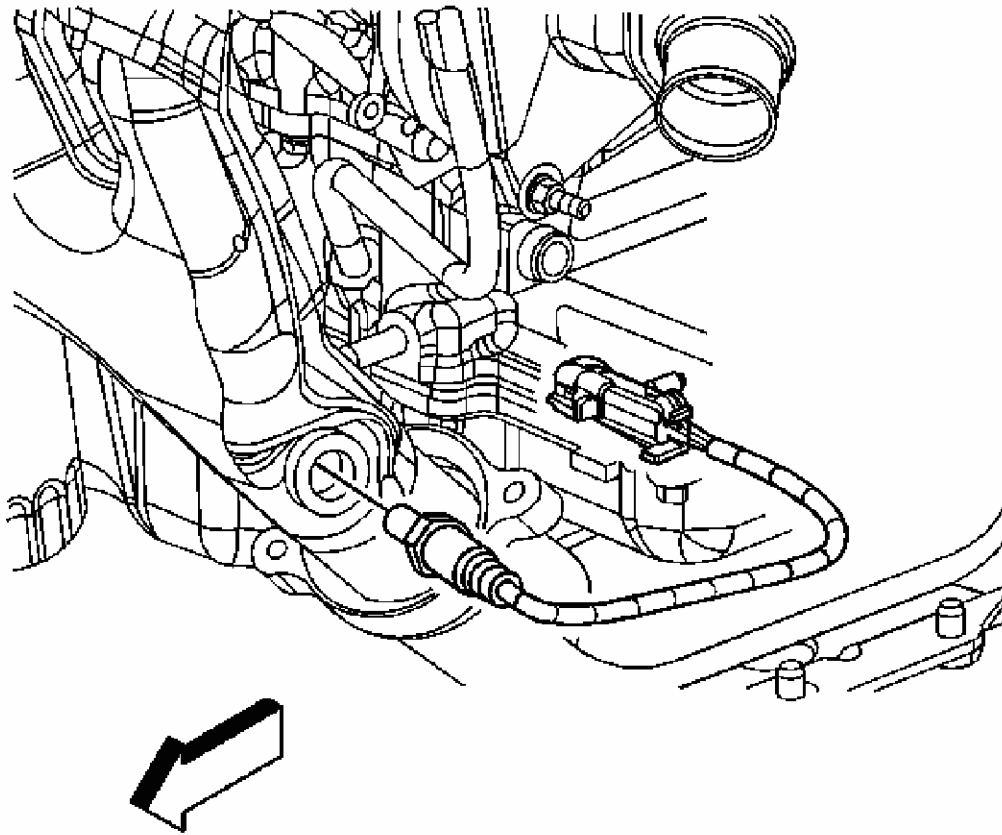


Fig. 19: Locating HO2S Wiring Harness Connector
Courtesy of GENERAL MOTORS CORP.

8. If reusing the old HO2S, coat the threads with anti-seize compound, GM P/N 12377953 or equivalent.
9. Install the HO2S.

Tighten: Tighten the sensor to 41 N.m (30 lb ft).

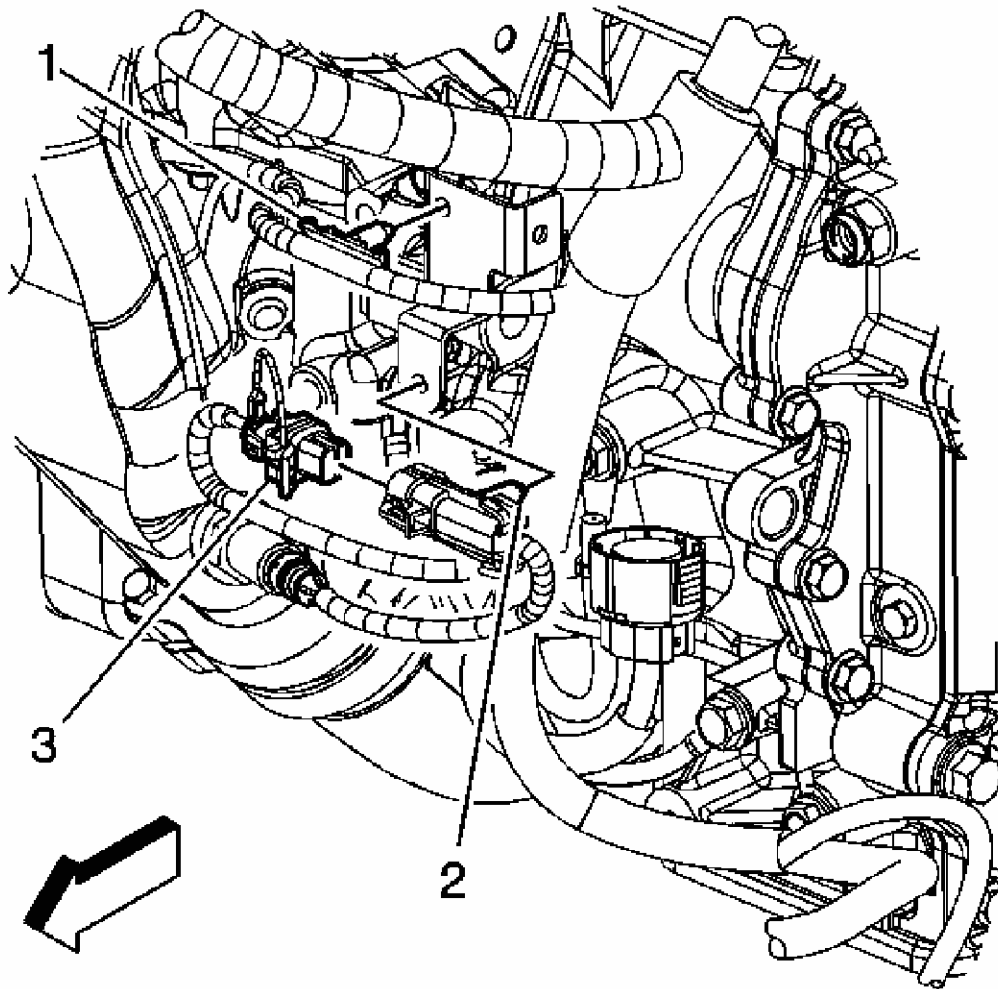


Fig. 20: View Of Engine Harness Electrical Connector & Clips
Courtesy of GENERAL MOTORS CORP.

10. Connect the engine harness electrical connector (3) to the HO2S.
11. Install the CPA retainer.
12. Install the front engine mount bracket. Refer to **Engine Front Mount Bracket Replacement** .

EXHAUST MANIFOLD REPLACEMENT - RIGHT SIDE (RPO L26)

Removal Procedure

CAUTION: Refer to **EXHAUST SERVICE CAUTION** .

CAUTION: Refer to PROTECTIVE GOGGLES AND GLOVE CAUTION .

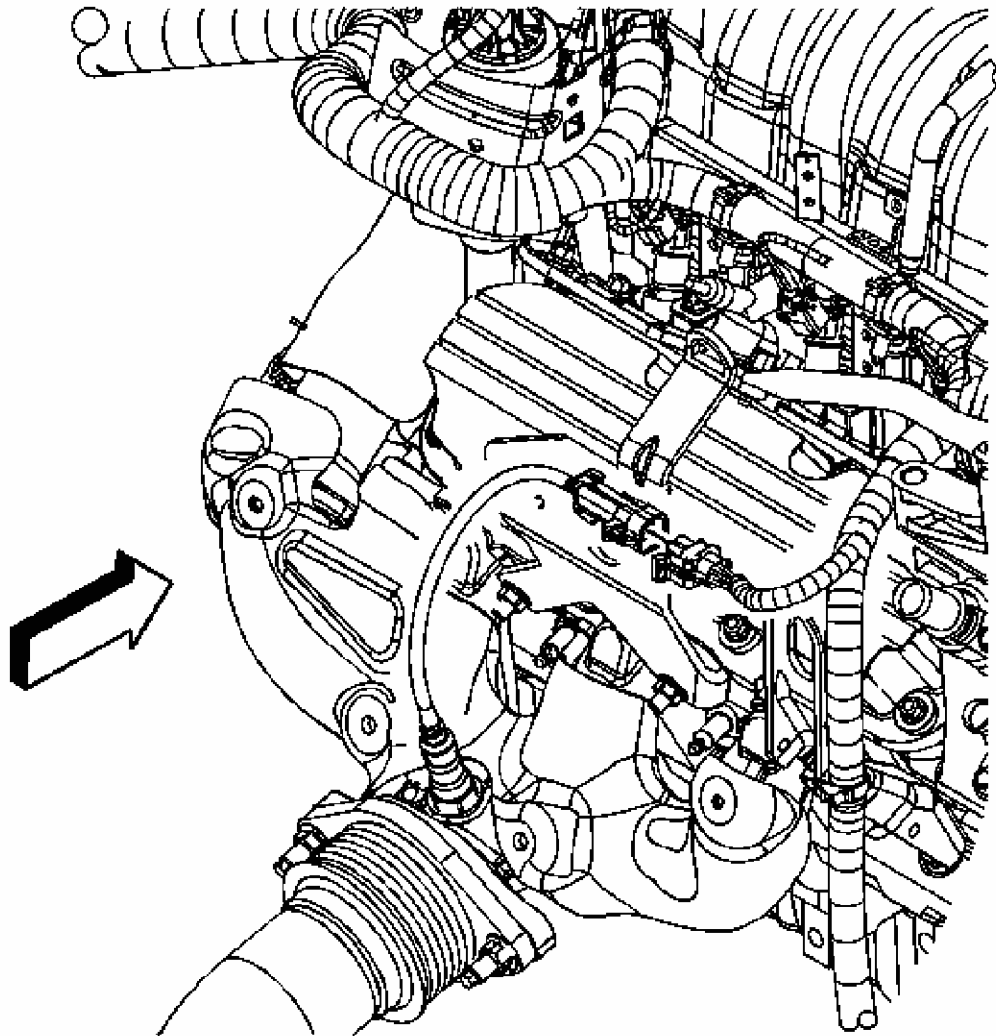


Fig. 21: View Of Right Side Exhaust Manifold
Courtesy of GENERAL MOTORS CORP.

1. Remove the intake manifold cover. Refer to Intake Manifold Cover Replacement .
2. Remove the right side spark plugs. Refer to Spark Plug Replacement .
3. Disconnect the engine harness electrical connector from the heated oxygen sensor (HO2S).

4. Remove the HO2S pigtail clip from the sight shield bracket.

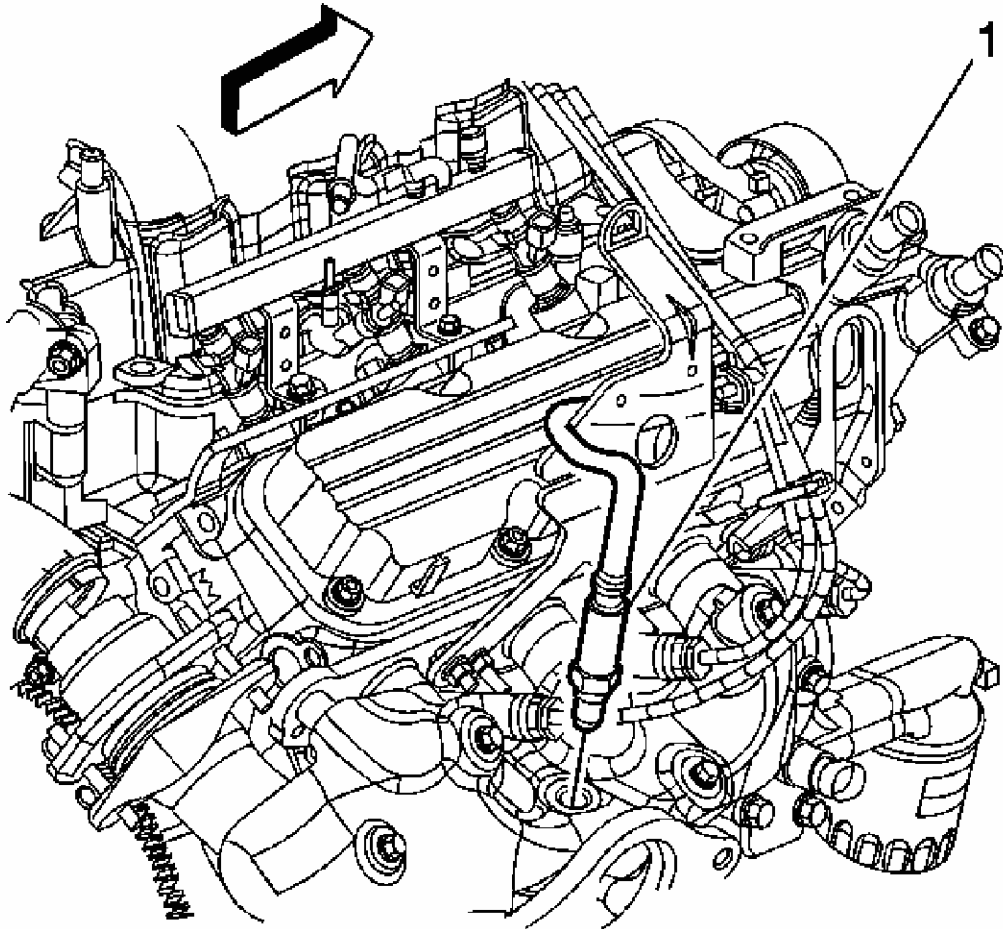


Fig. 22: Removing/Installing HO2S
Courtesy of GENERAL MOTORS CORP.

5. Remove the HO2S (1) from the exhaust manifold.

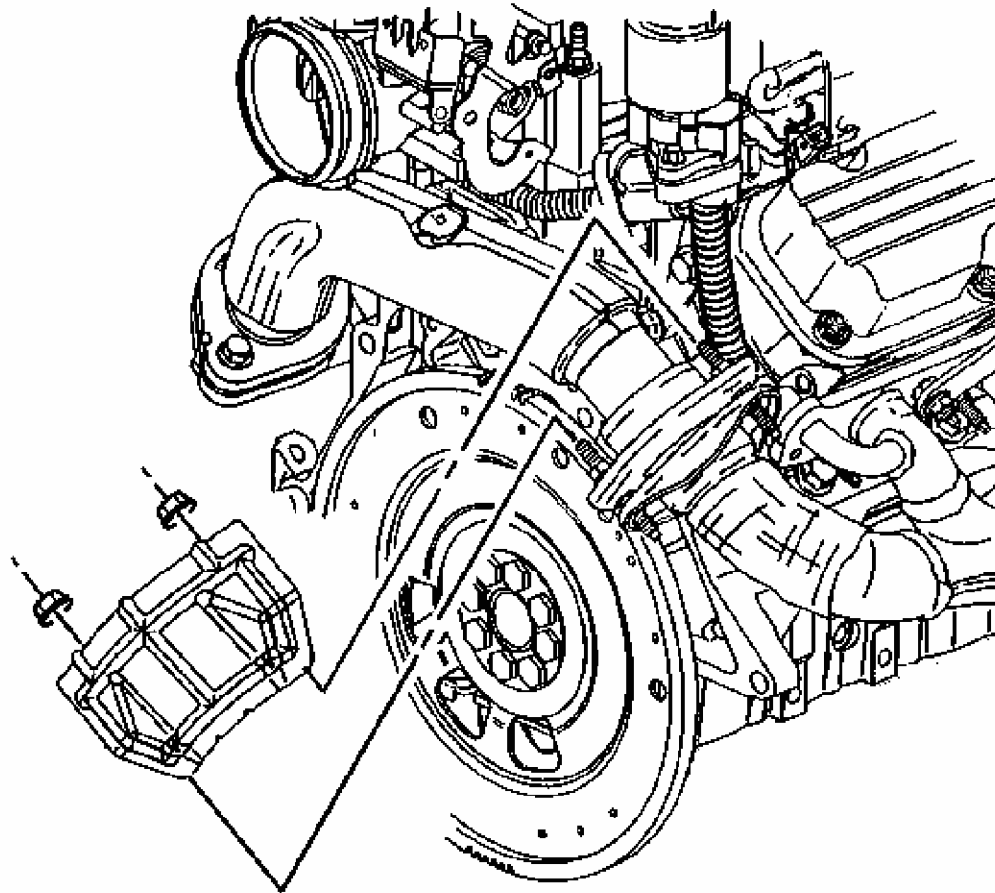


Fig. 23: View Of Exhaust Crossover Heat Shield
Courtesy of GENERAL MOTORS CORP.

6. Remove the power brake booster heat shield nuts.
7. Remove the power brake booster heat shield.

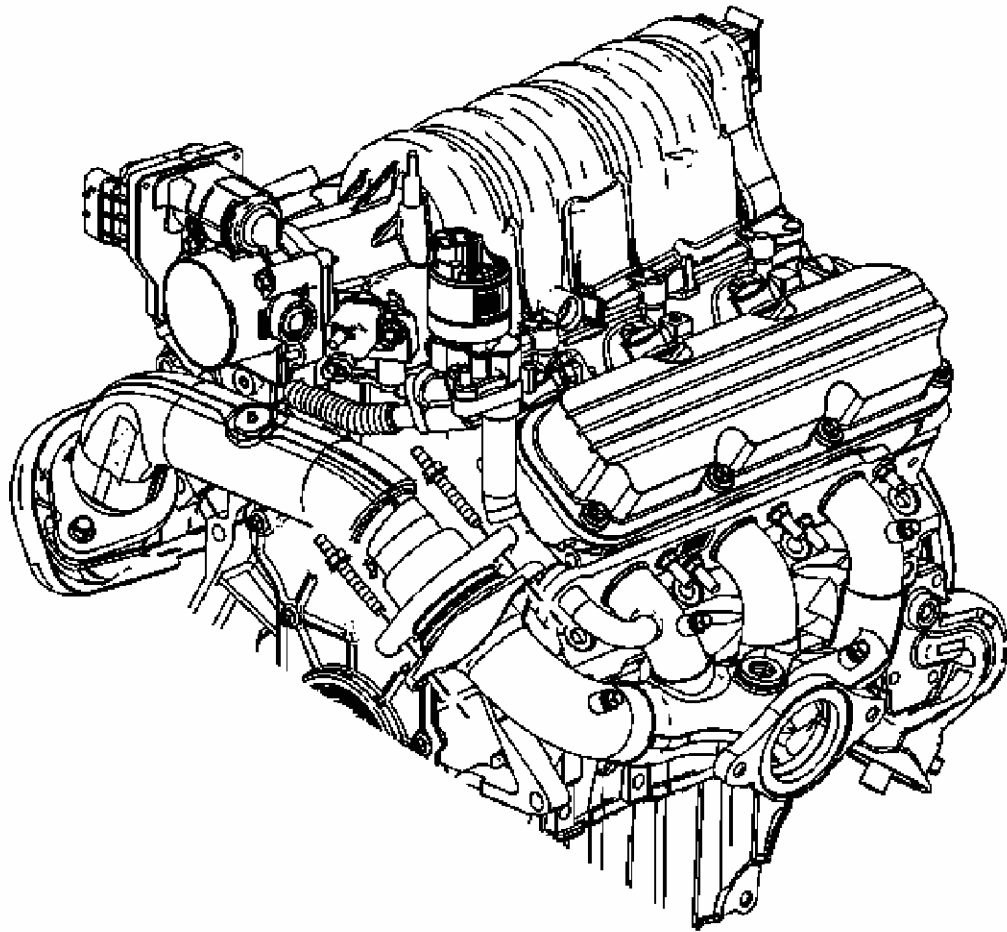


Fig. 24: Removing/Installing Exhaust Crossover Pipe
Courtesy of GENERAL MOTORS CORP.

8. Remove the studs attaching the exhaust crossover to the right exhaust manifold.
9. Remove the transaxle fill tube. Refer to **Transmission Fluid Filler Tube and Seal Replacement**.
10. Remove the catalytic converter. Refer to **Catalytic Converter Replacement**.

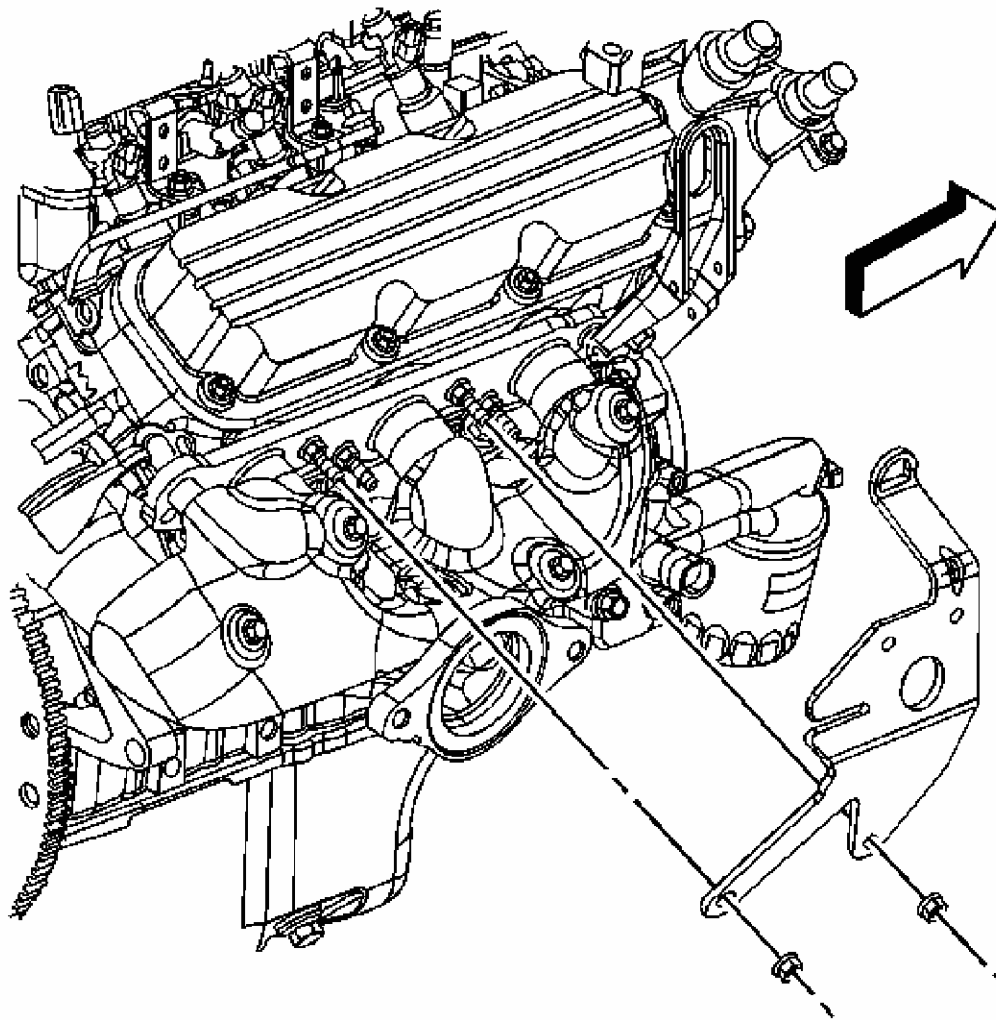


Fig. 25: Identifying Sight Shield Bracket Nuts & Bracket
Courtesy of GENERAL MOTORS CORP.

11. Remove the sight shield bracket nuts and bracket.

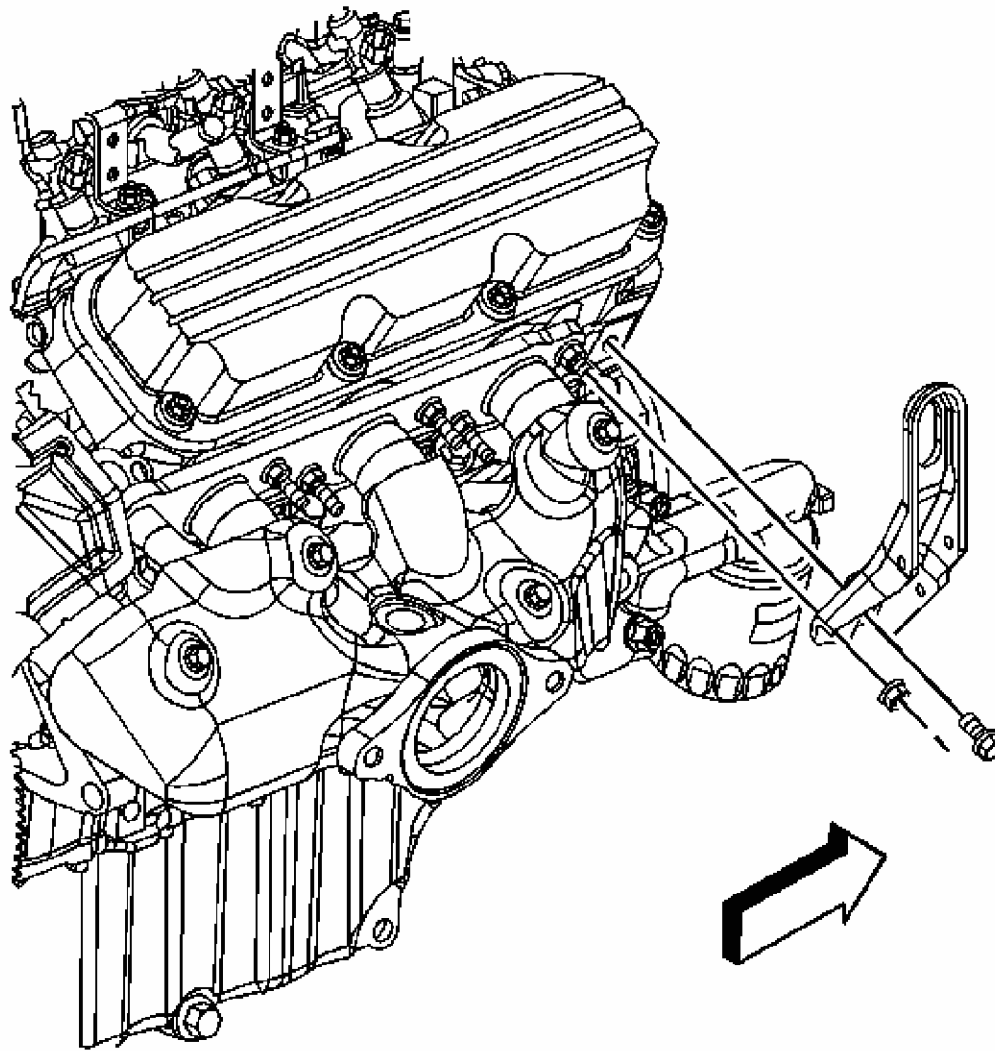


Fig. 26: Identifying Right Engine Lift Bracket Bolt & Nut
Courtesy of GENERAL MOTORS CORP.

12. Remove the right engine lift bracket bolt and nut.
13. Remove the engine lift bracket.

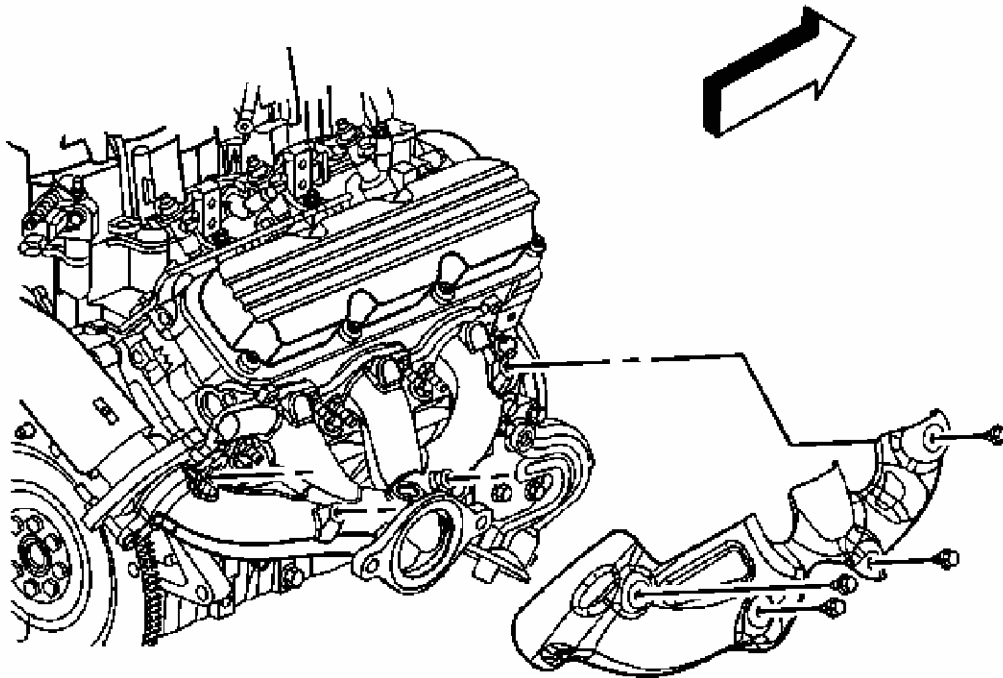


Fig. 27: View Of Exhaust Manifold Heat Shield Bolts & Shield
Courtesy of GENERAL MOTORS CORP.

14. Remove the exhaust manifold heat shield bolts and shield.

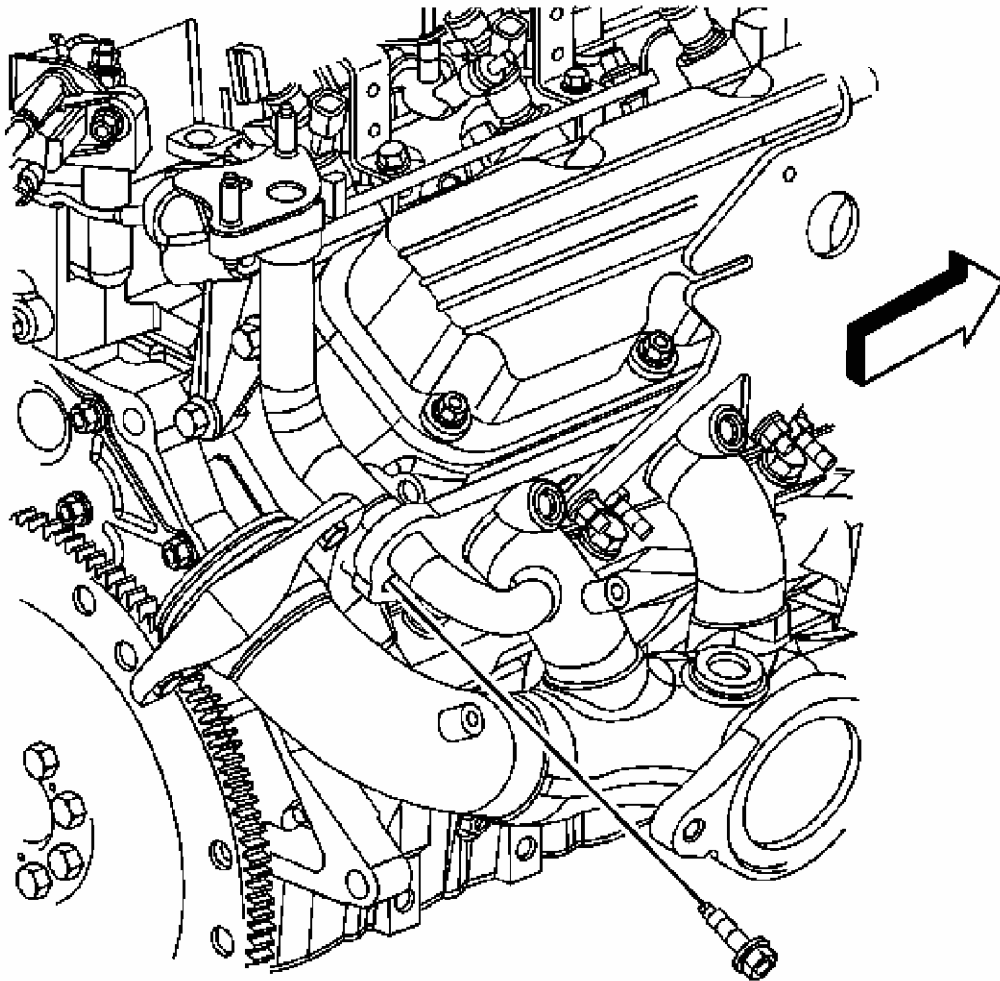


Fig. 28: View Of Exhaust Gas Recirculation (EGR) Valve Adapter Pipe Bolt
Courtesy of GENERAL MOTORS CORP.

15. Remove the exhaust gas recirculation (EGR) valve adapter pipe bolt.

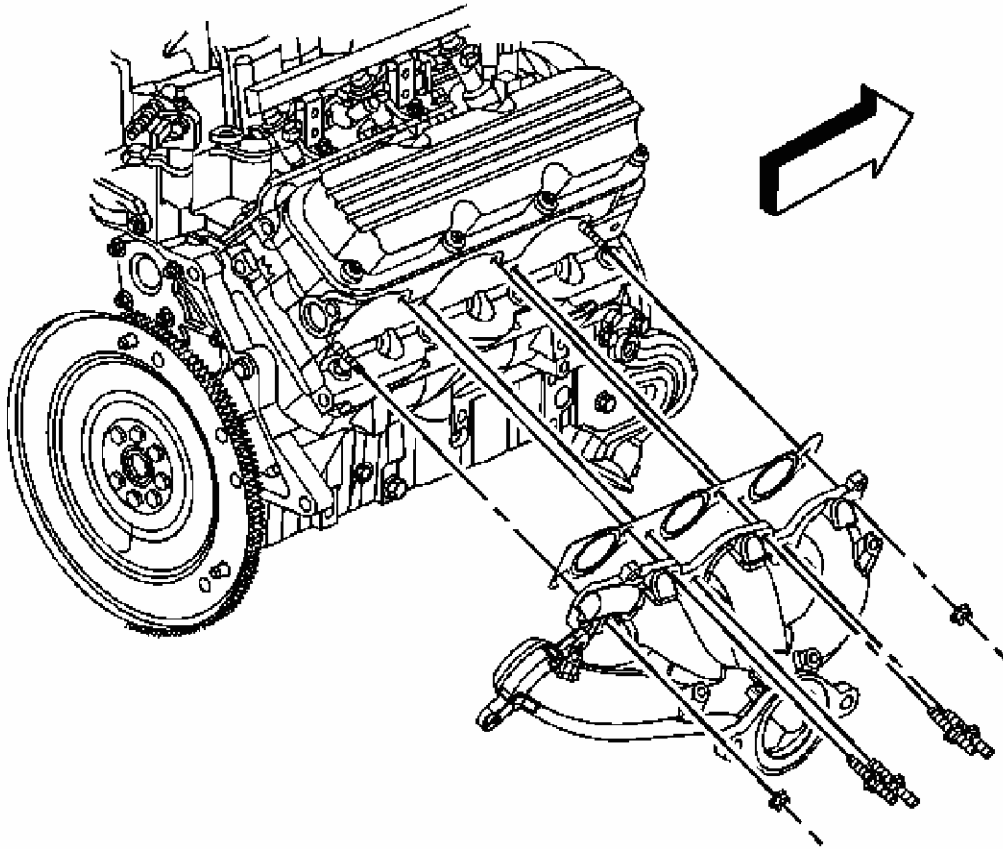


Fig. 29: Removing/Installing Right Exhaust Manifold
Courtesy of GENERAL MOTORS CORP.

16. Remove the exhaust manifold studs and nuts.
17. Remove the exhaust manifold.
18. Remove and discard the exhaust manifold gasket.
19. Remove and discard the exhaust crossover pipe seal from the either the exhaust crossover or the manifold.

Installation Procedure

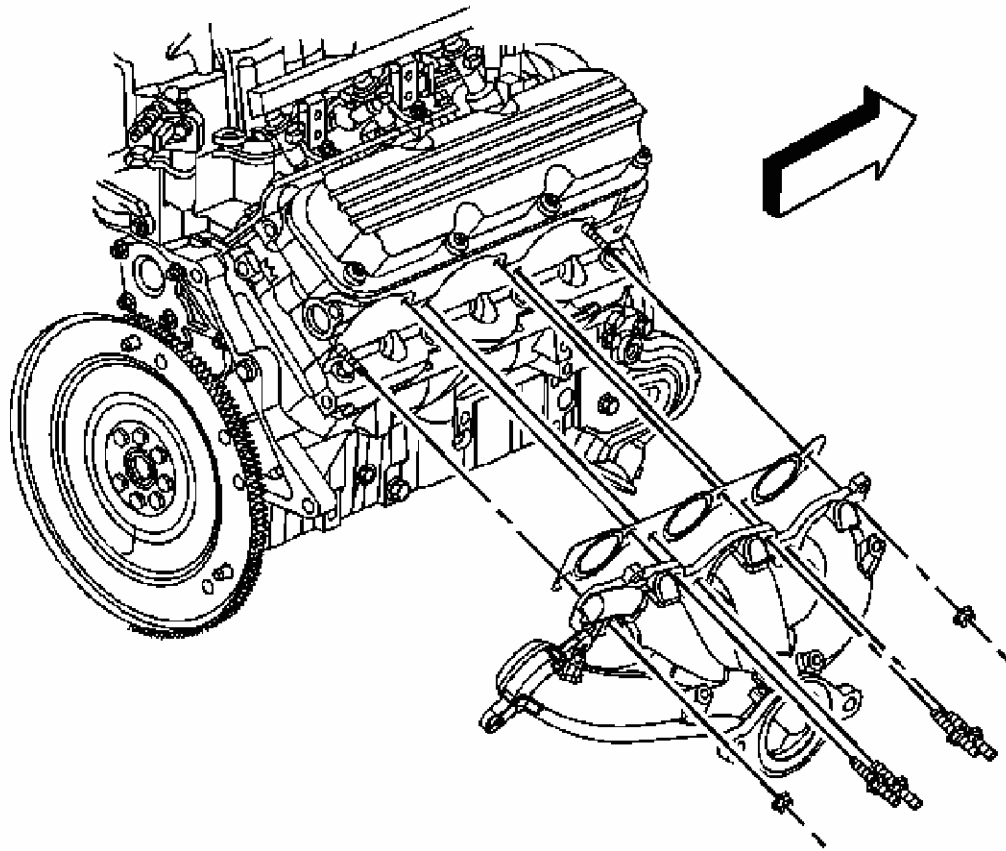


Fig. 30: Removing/Installing Right Exhaust Manifold
Courtesy of GENERAL MOTORS CORP.

1. Install a NEW exhaust crossover pipe seal to the exhaust manifold.
2. Install a NEW exhaust manifold gasket.
3. Install the exhaust manifold.

NOTE: **Refer to Fastener Notice .**

4. Install the exhaust manifold studs and nuts.

Tighten:

- Tighten the studs to 30 N.m (22 lb ft).
- Tighten the nuts to 25 N.m (18 lb ft).

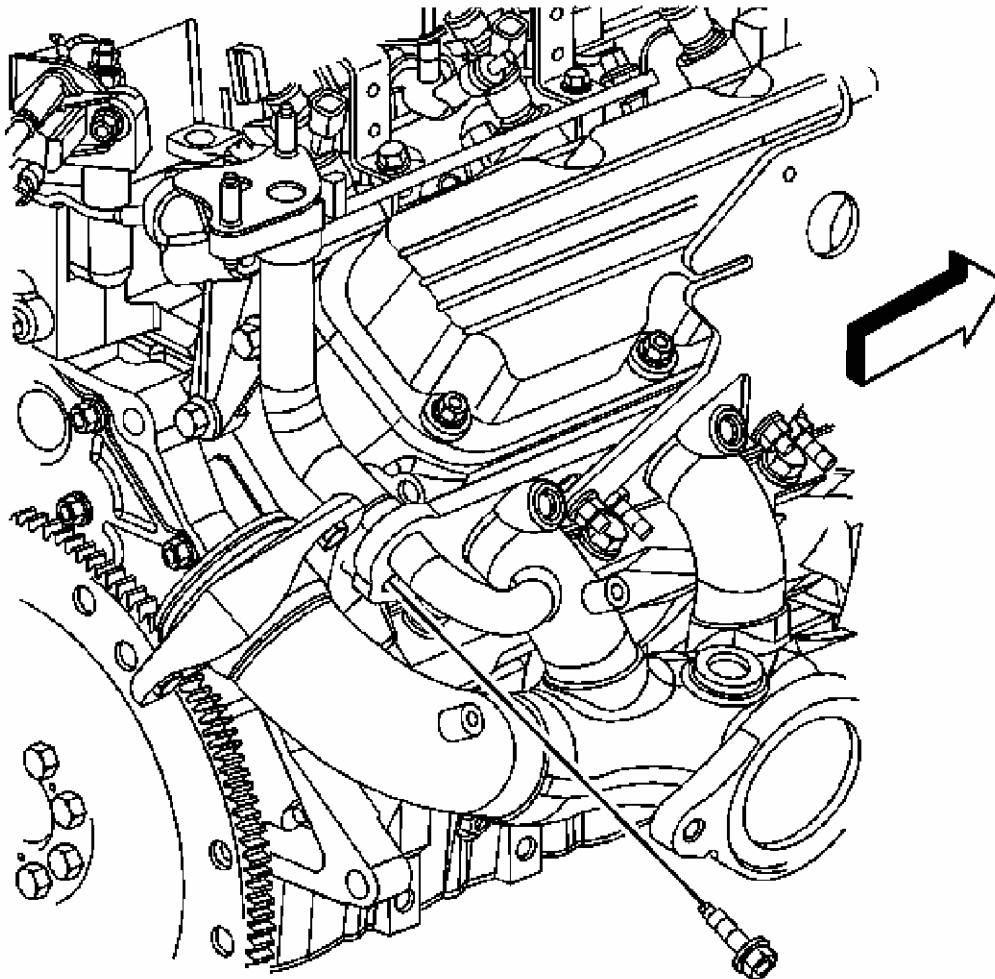


Fig. 31: View Of Exhaust Gas Recirculation (EGR) Valve Adapter Pipe Bolt
Courtesy of GENERAL MOTORS CORP.

5. Install the EGR valve adapter pipe bolt.

Tighten: Tighten the bolt to 25 N.m (18 lb ft).

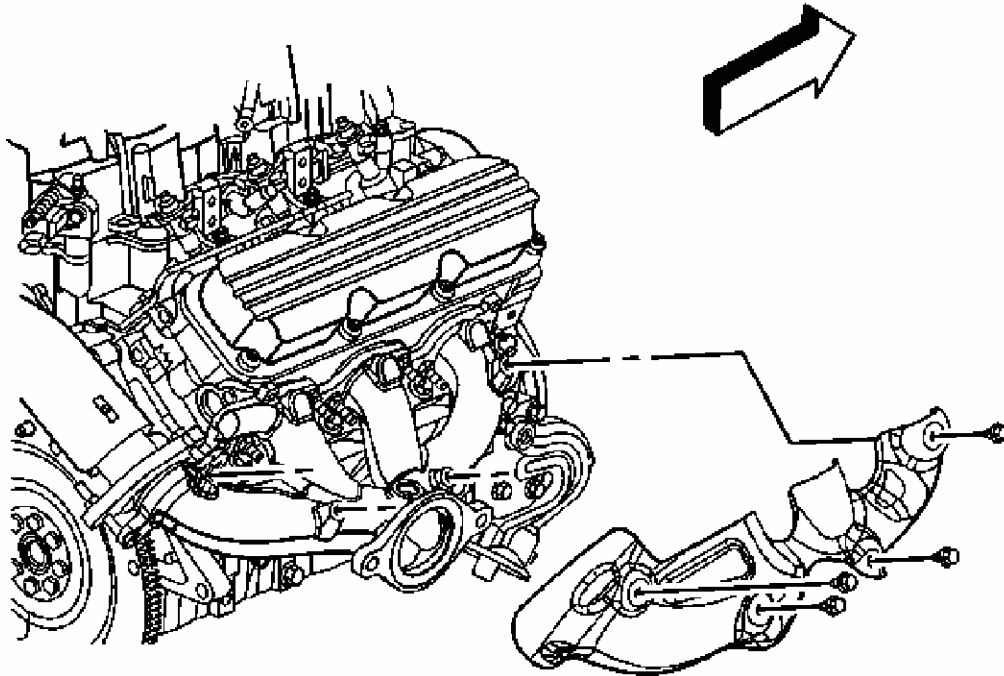


Fig. 32: View Of Exhaust Manifold Heat Shield Bolts & Shield
Courtesy of GENERAL MOTORS CORP.

6. Position the exhaust manifold heat shield.
7. Install the exhaust manifold heat shield bolts.

Tighten: Tighten the bolts to 10 N.m (89 lb in).

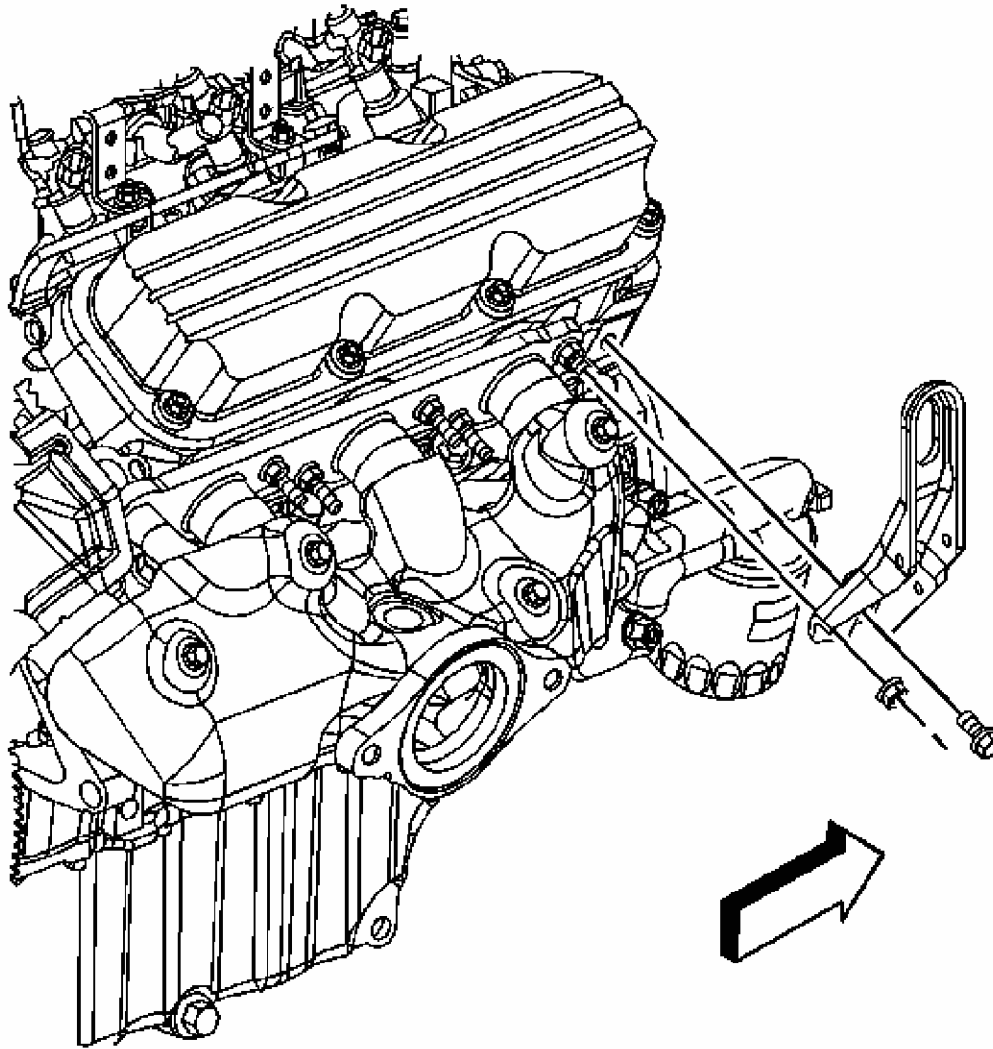


Fig. 33: Identifying Right Engine Lift Bracket Bolt & Nut
Courtesy of GENERAL MOTORS CORP.

8. Install the engine lift bracket.
9. Install the right engine lift bracket bolt and nut.

Tighten: Tighten the bolt/nut to 25 N.m (18 lb ft).

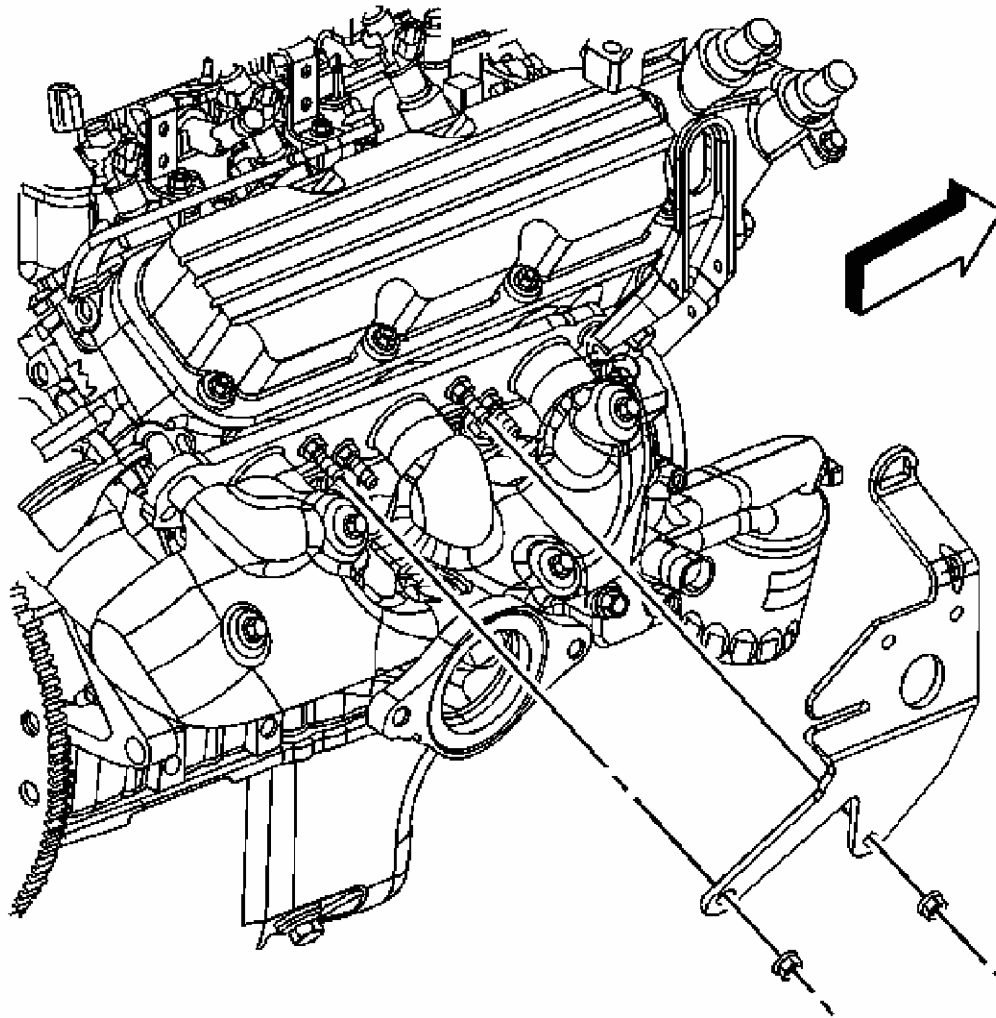


Fig. 34: Identifying Sight Shield Bracket Nuts & Bracket
Courtesy of GENERAL MOTORS CORP.

10. Install the sight shield bracket nuts and bracket.

Tighten: Tighten the nuts to 30 N.m (22 lb ft).

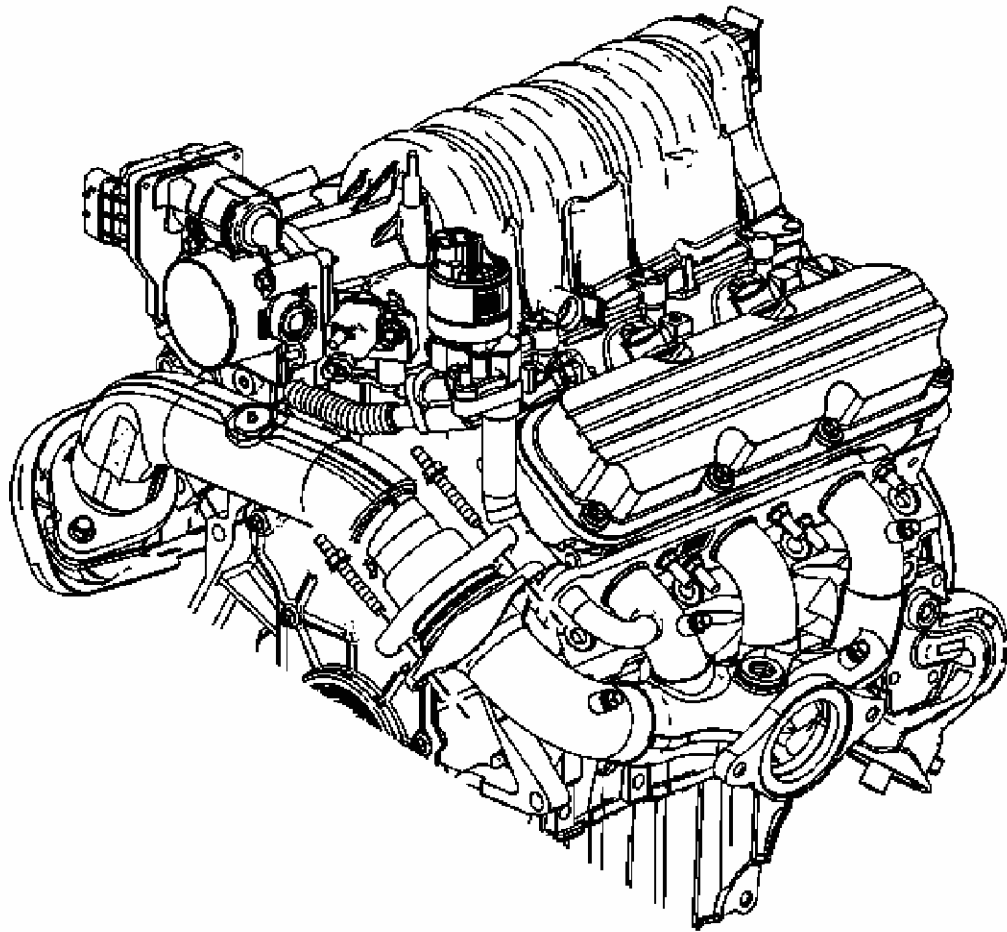


Fig. 35: Removing/Installing Exhaust Crossover Pipe
Courtesy of GENERAL MOTORS CORP.

11. Install the catalytic converter. Refer to **Catalytic Converter Replacement**.
12. Install the transaxle fill tube. Refer to **Transmission Fluid Filler Tube and Seal Replacement**.
13. Install the studs attaching the exhaust crossover to the right exhaust manifold.

Tighten: Tighten the studs to 18 N.m (13 lb ft).

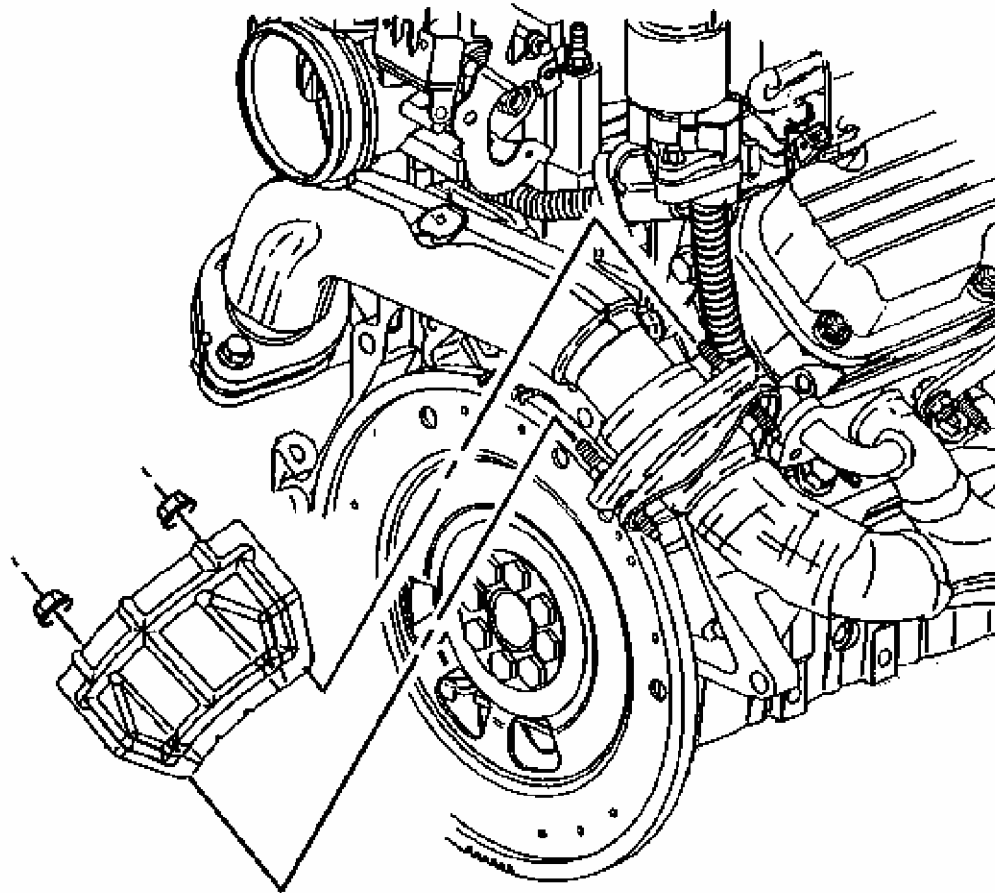


Fig. 36: View Of Exhaust Crossover Heat Shield
Courtesy of GENERAL MOTORS CORP.

14. Install the power brake booster heat shield.
15. Install the power brake booster heat shield nuts.

Tighten: Tighten the nuts to 20 N.m (15 lb ft).

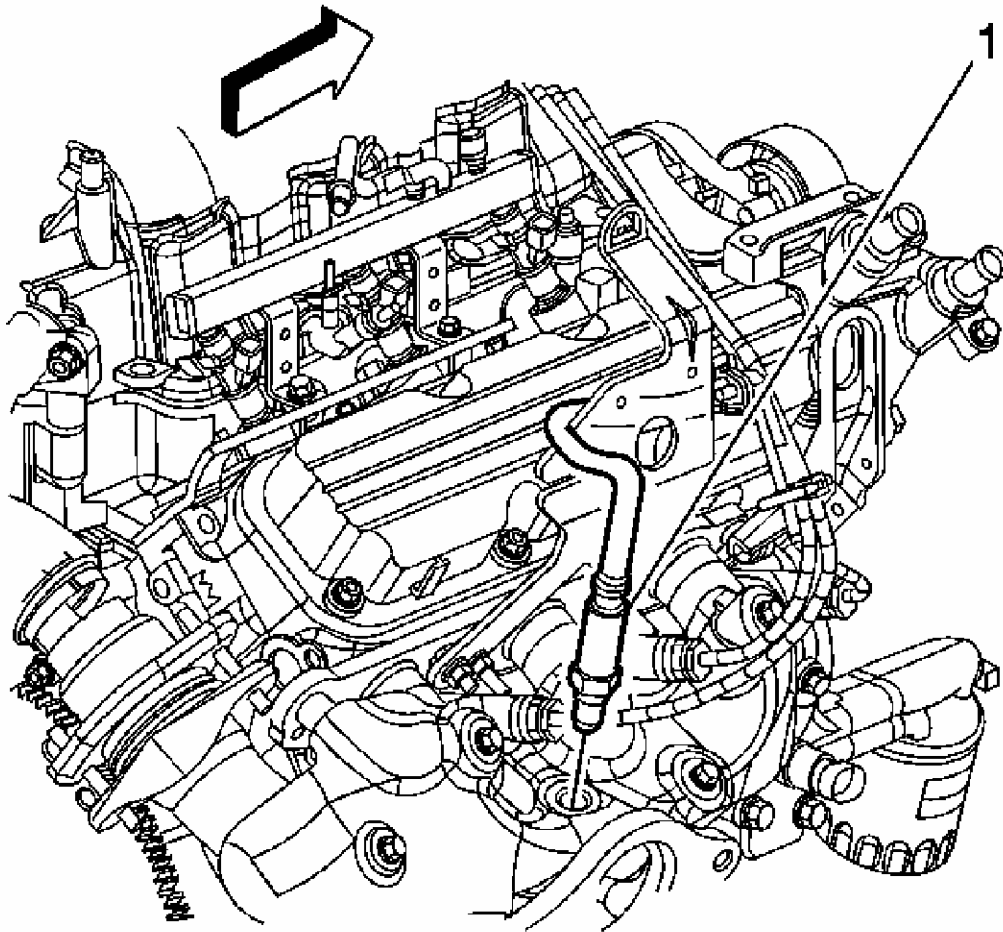


Fig. 37: Removing/Installing HO2S
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: A special anti-seize compound is used on the HO2S threads. The compound consists of liquid graphite and glass beads. The graphite tends to burn away, but the glass beads remain, making the sensor easier to remove. New or service replacement sensors already have the compound applied to the threads. If the sensor is removed from an exhaust component and if for any reason the sensor is to be reinstalled, the threads must have anti-seize compound applied before the reinstallation.

16. If reinstalling the old sensor, coat the threads with anti-seize compound GM P/N 12377953 or equivalent.

17. Install the HO2S (1) to the exhaust manifold.

Tighten: Tighten the sensor to 42 N.m (31 lb ft).

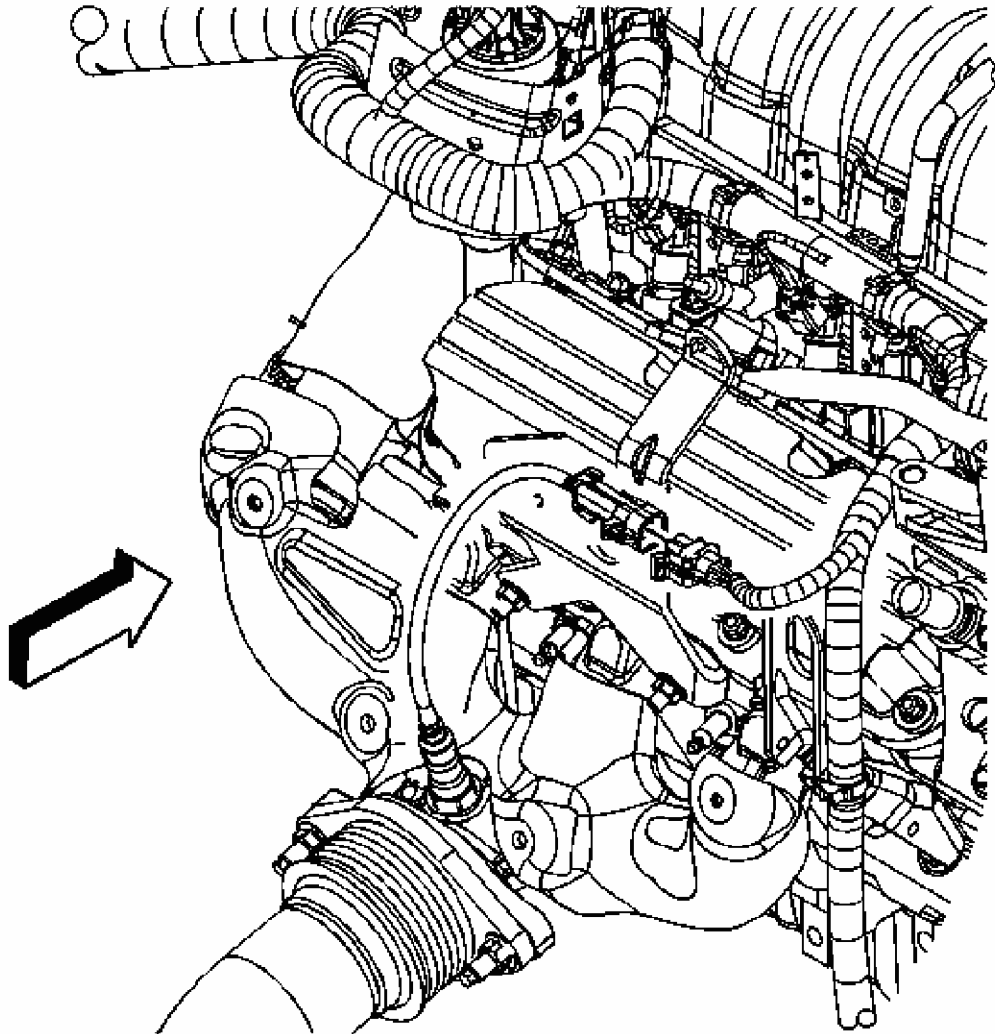


Fig. 38: View Of Right Side Exhaust Manifold
Courtesy of GENERAL MOTORS CORP.

18. Connect the engine harness electrical connector to the HO2S.
19. Install the HO2S pigtail clip to the sight shield bracket.
20. Install the right side spark plugs. Refer to **Spark Plug Replacement** .
21. Install the intake manifold cover. Refer to **Intake Manifold Cover Replacement** .

EXHAUST MANIFOLD REPLACEMENT - RIGHT SIDE (RPO LD8)

Tools Required

J 42640 Steering Column Anti-Rotation Pin

Removal Procedure

CAUTION: Refer to EXHAUST SERVICE CAUTION .

CAUTION: Refer to PROTECTIVE GOGGLES AND GLOVE CAUTION .

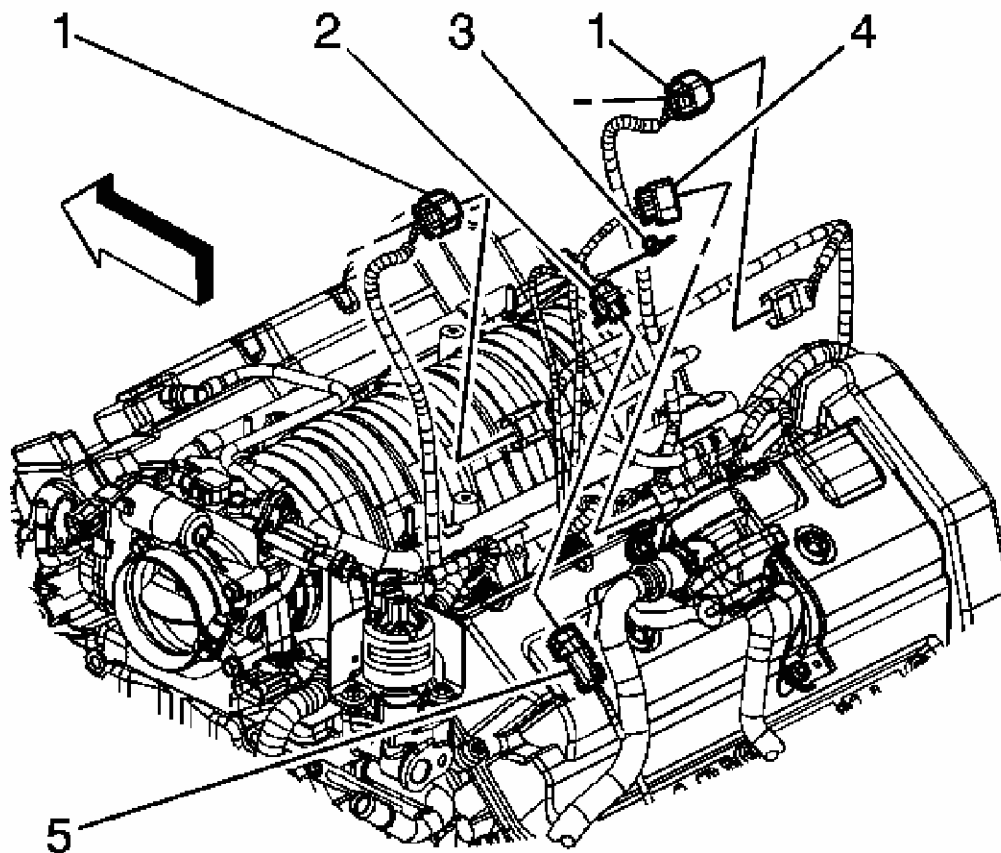


Fig. 39: Identifying Engine Harness Electrical Connectors
Courtesy of GENERAL MOTORS CORP.

1. Remove the connector position assurance (CPA) retainer (3).

2. Disconnect the engine harness electrical connector (2) from the heated oxygen sensor (HO2S).
3. Remove the HO2S clip (5) from the secondary air injection (AIR) valve hose bracket.

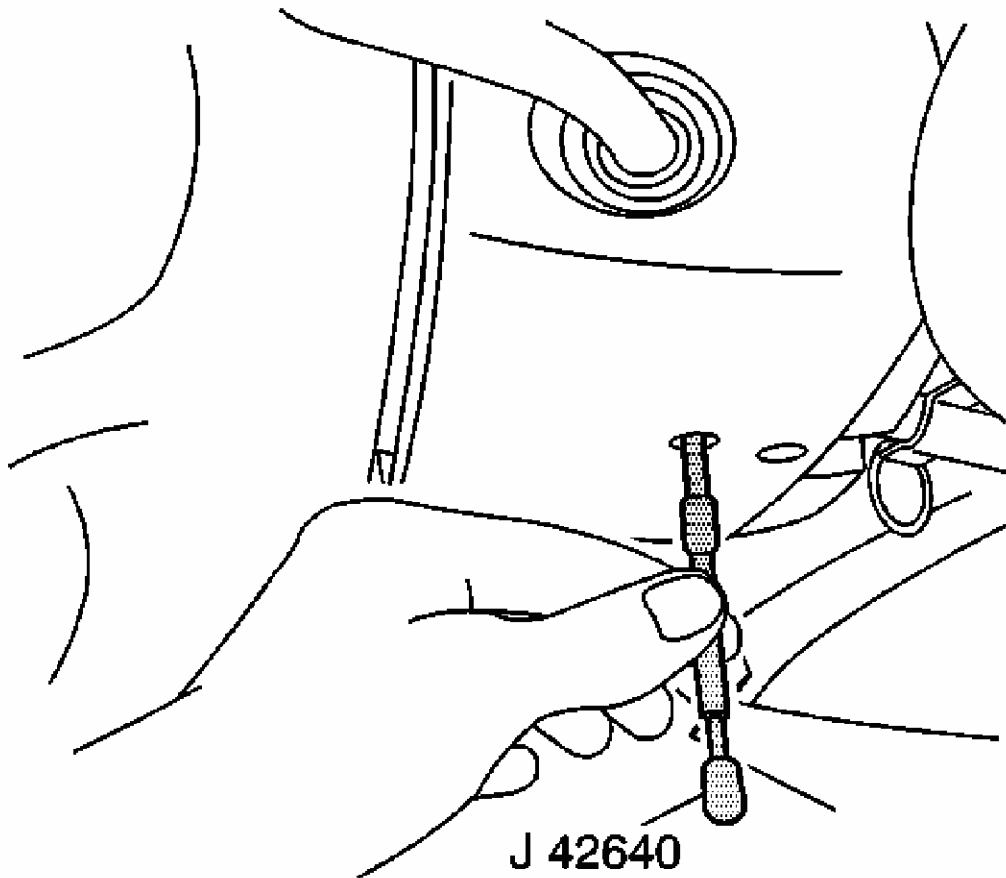


Fig. 40: Identifying J 42640

Courtesy of GENERAL MOTORS CORP.

NOTE: The wheels of the vehicle must be straight ahead and the steering column in the LOCK position before disconnecting the steering column or intermediate shaft from the steering gear. Failure to do so will cause the coil assembly in the steering column to become uncentered which will cause damage to the coil assembly.

4. Lock the steering column by installing the **J 42640** into the underside of the steering column.

5. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
6. Remove the rear exhaust manifold pipe. Refer to **Exhaust Manifold Rear Pipe Replacement (RPO LD8)**.
7. Remove the AIR check valve. Refer to **Secondary Air Injection Check Valve Replacement** .

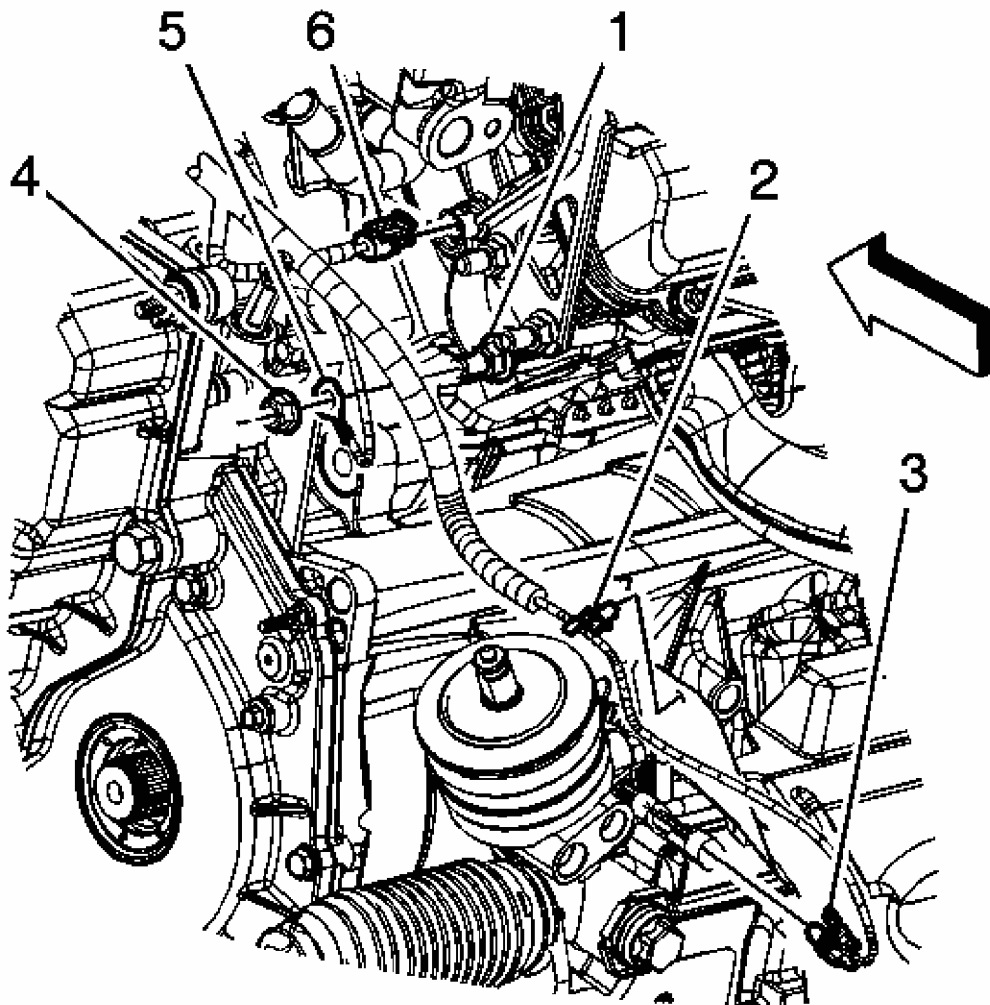


Fig. 41: View Of Engine Harness Clips
Courtesy of GENERAL MOTORS CORP.

8. Disconnect the engine harness clip (2) from the steering gear heat shield.

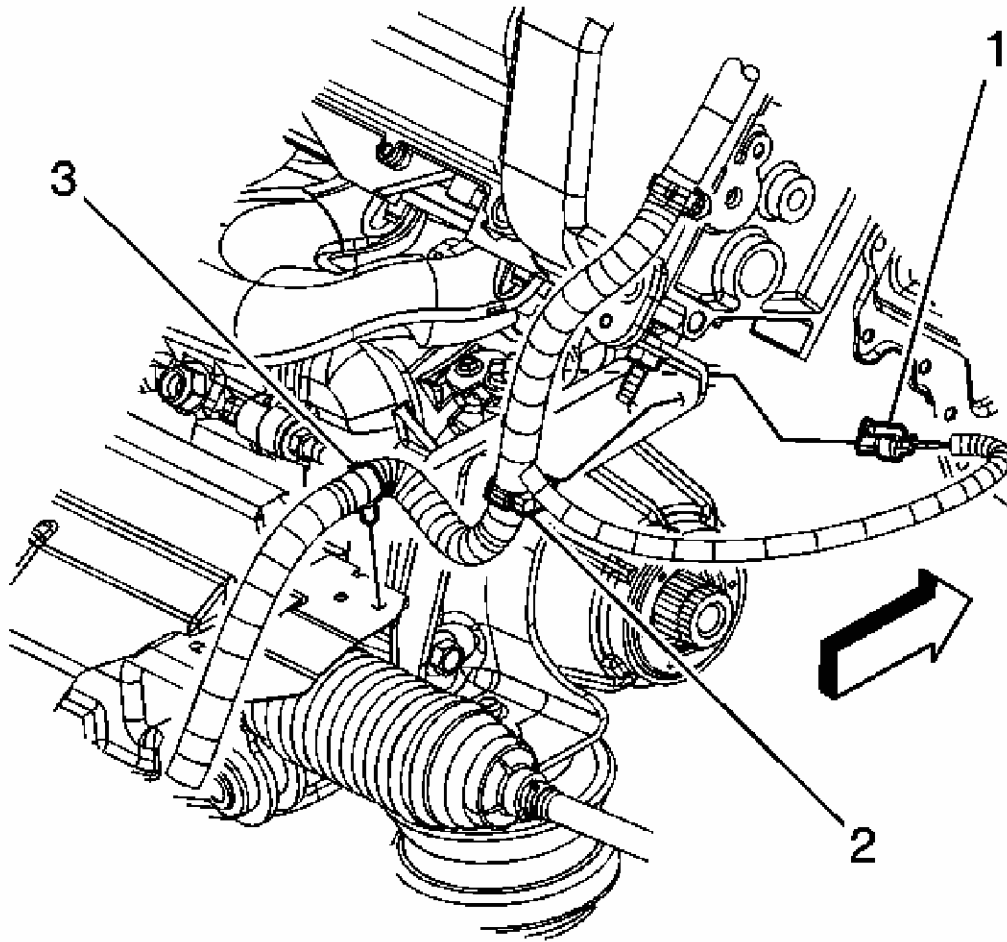


Fig. 42: Disconnecting/Connecting Engine Harness Clip At Steering Gear Heat Shield

Courtesy of GENERAL MOTORS CORP.

9. Disconnect the engine harness clip (3) from the steering gear heat shield.

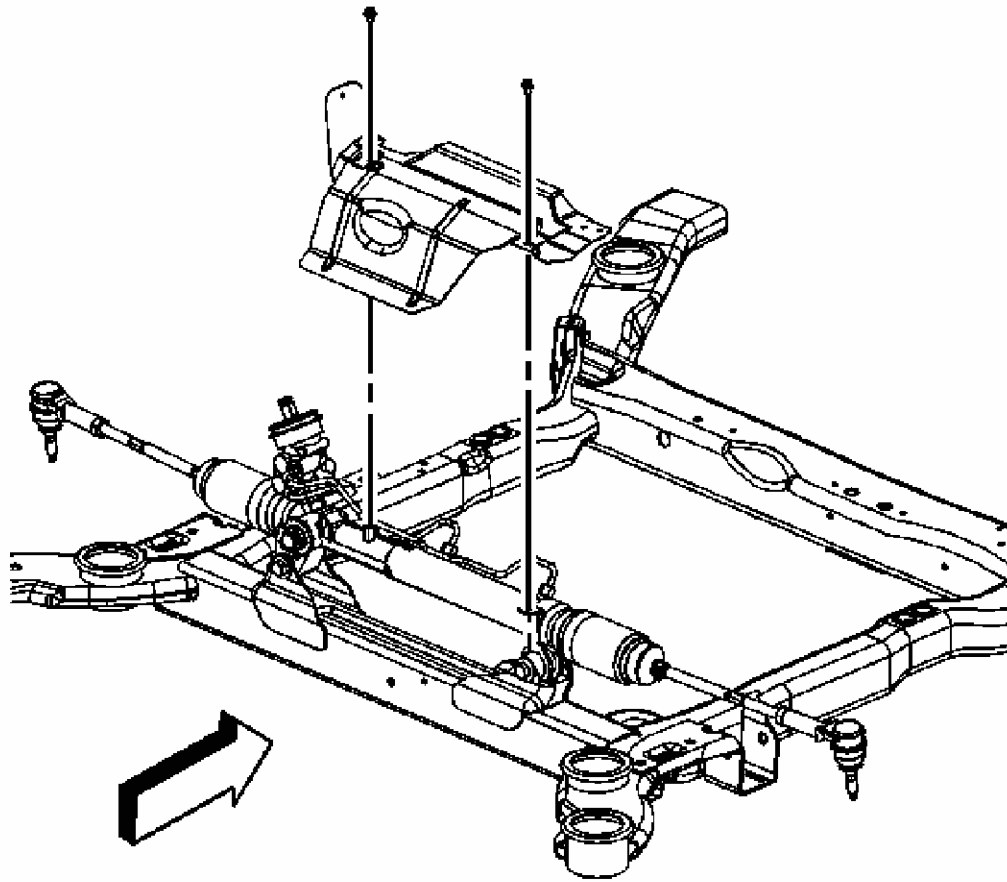


Fig. 43: View Of Steering Gear Heat Shield & Bolts
Courtesy of GENERAL MOTORS CORP.

10. Remove the steering gear heat shield bolts.
11. Remove the steering gear heat shield.

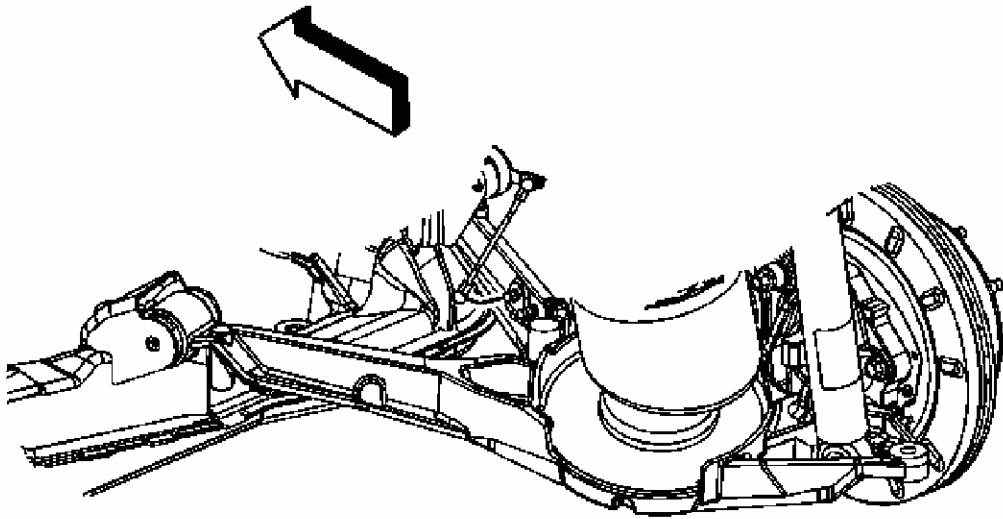


Fig. 44: Identifying Electronic Suspension Front Position Sensor Link
Courtesy of GENERAL MOTORS CORP.

12. Disconnect the electronic suspension position sensor link ball studs from the lower control arms.

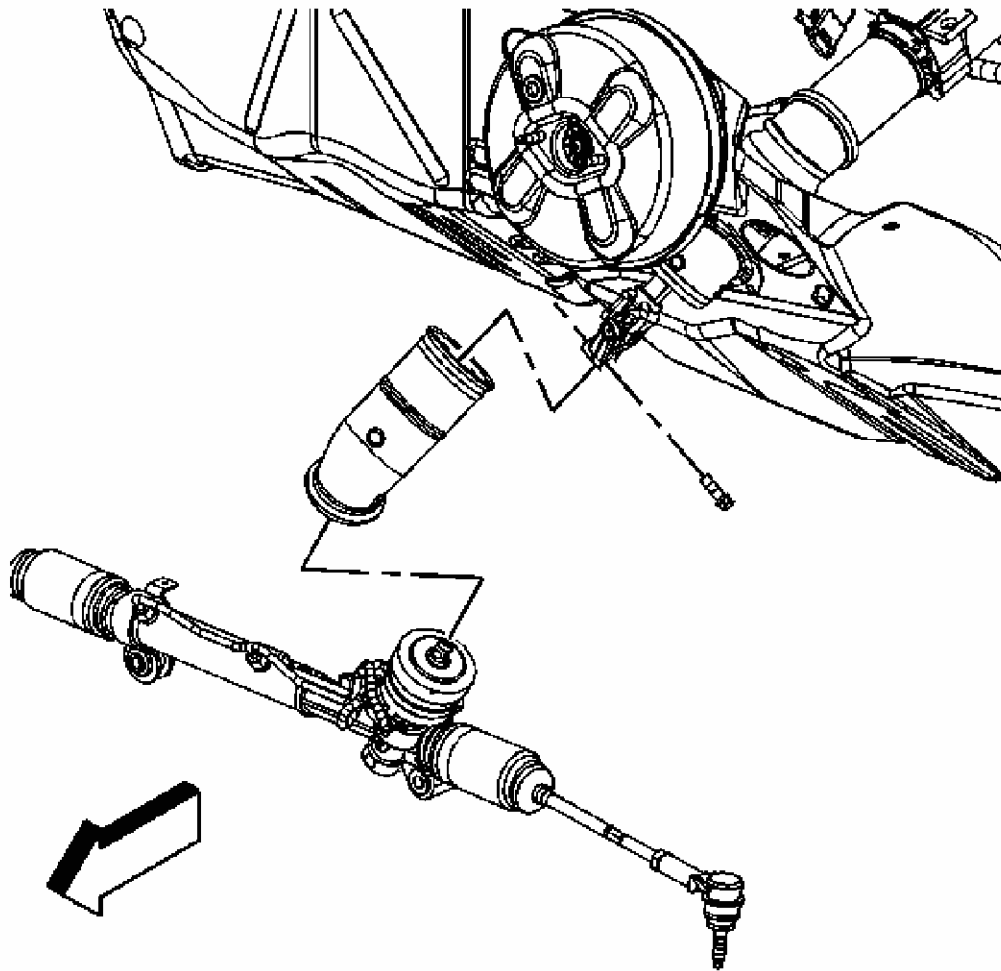


Fig. 45: Identifying Steering Gear & Related Attachments
Courtesy of GENERAL MOTORS CORP.

CAUTION: Failure to disconnect the intermediate shaft from the rack and pinion stub shaft can result in damage to the steering gear and/or damage to the intermediate shaft. This damage may cause loss of steering control which could result in personal injury.

13. Unsnap and remove the intermediate shaft seal.
14. Remove the intermediate shaft pinch bolt.
15. Separate the intermediate shaft from the steering gear.

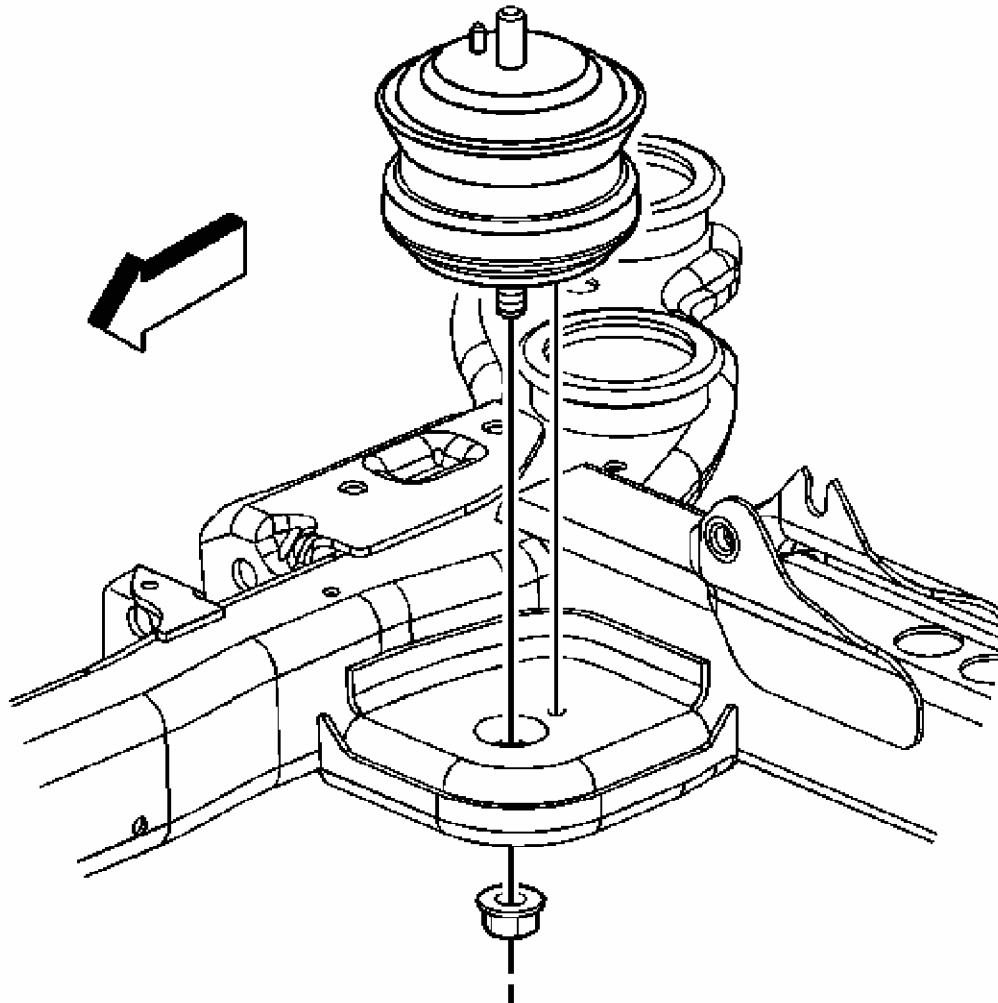


Fig. 46: View Of Right Engine Mount To Frame Nut
Courtesy of GENERAL MOTORS CORP.

16. Remove the right engine mount to frame nut.

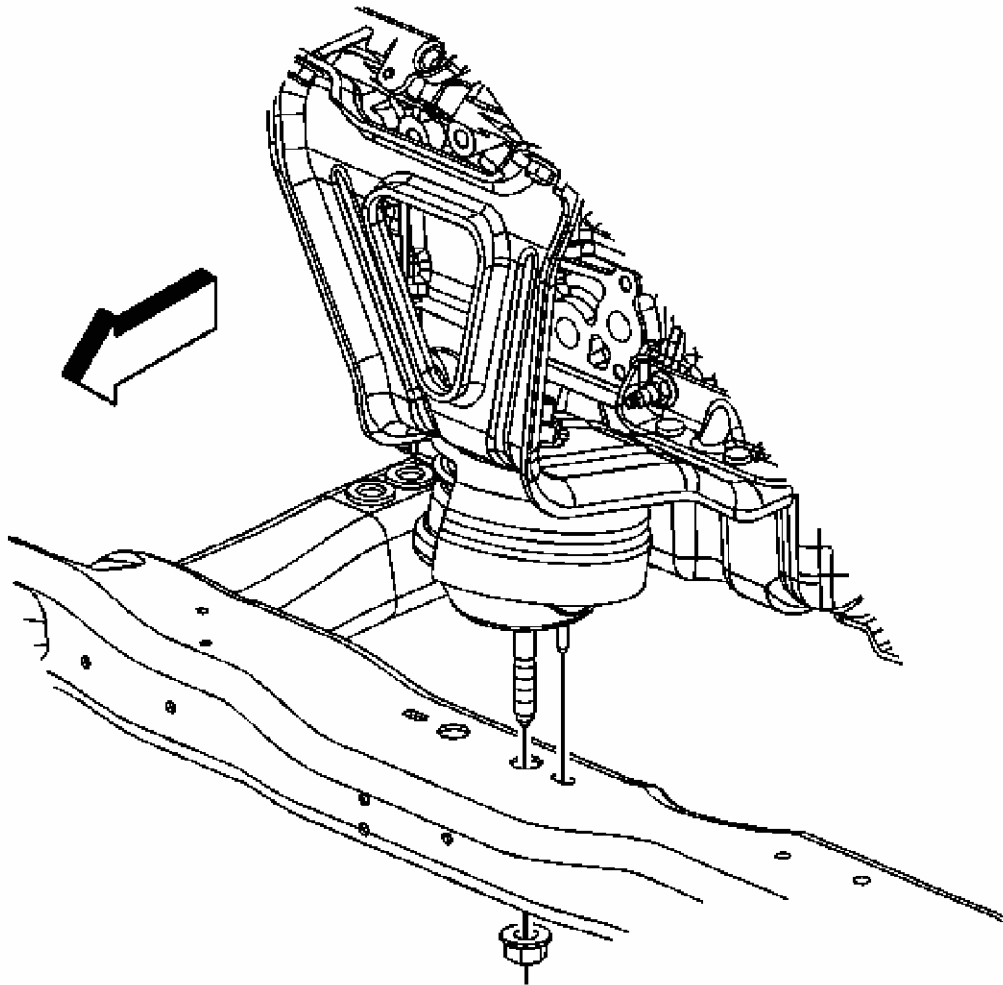


Fig. 47: Identifying Engine Mount To Frame Nut
Courtesy of GENERAL MOTORS CORP.

17. Remove the left engine mount to frame nut.

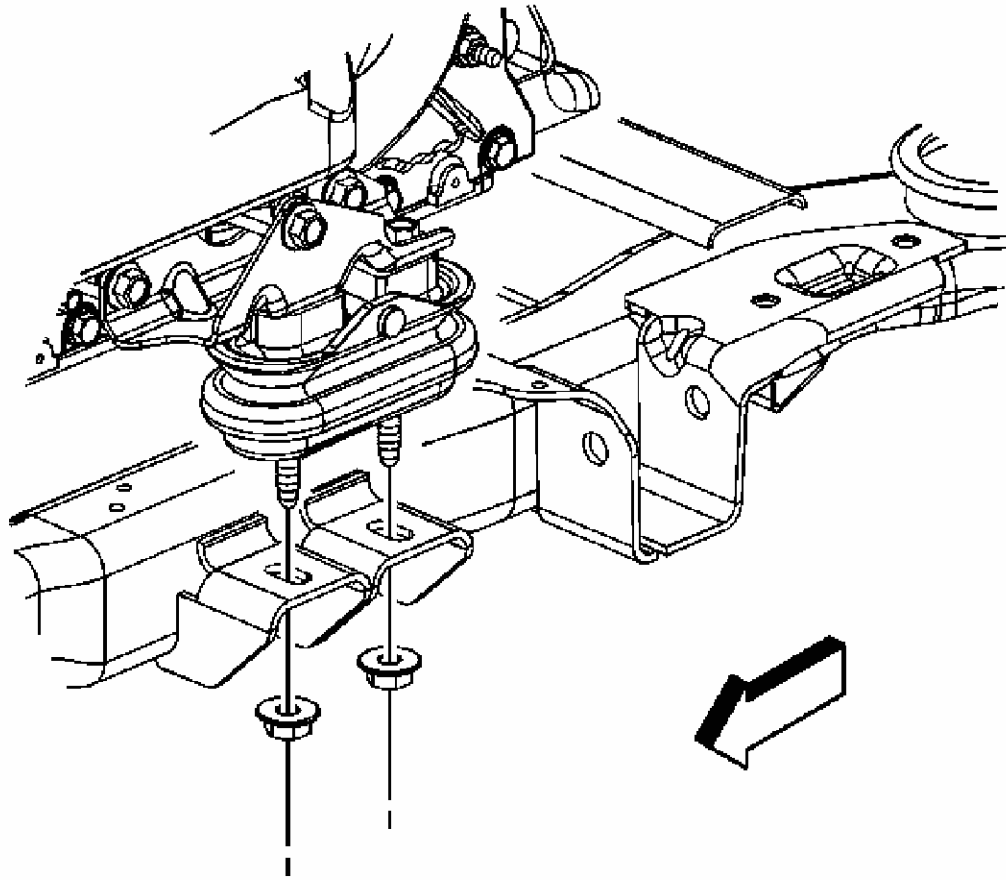


Fig. 48: Identifying Transaxle Mount To Frame Nuts
Courtesy of GENERAL MOTORS CORP.

18. Remove the transaxle mount to frame nuts.

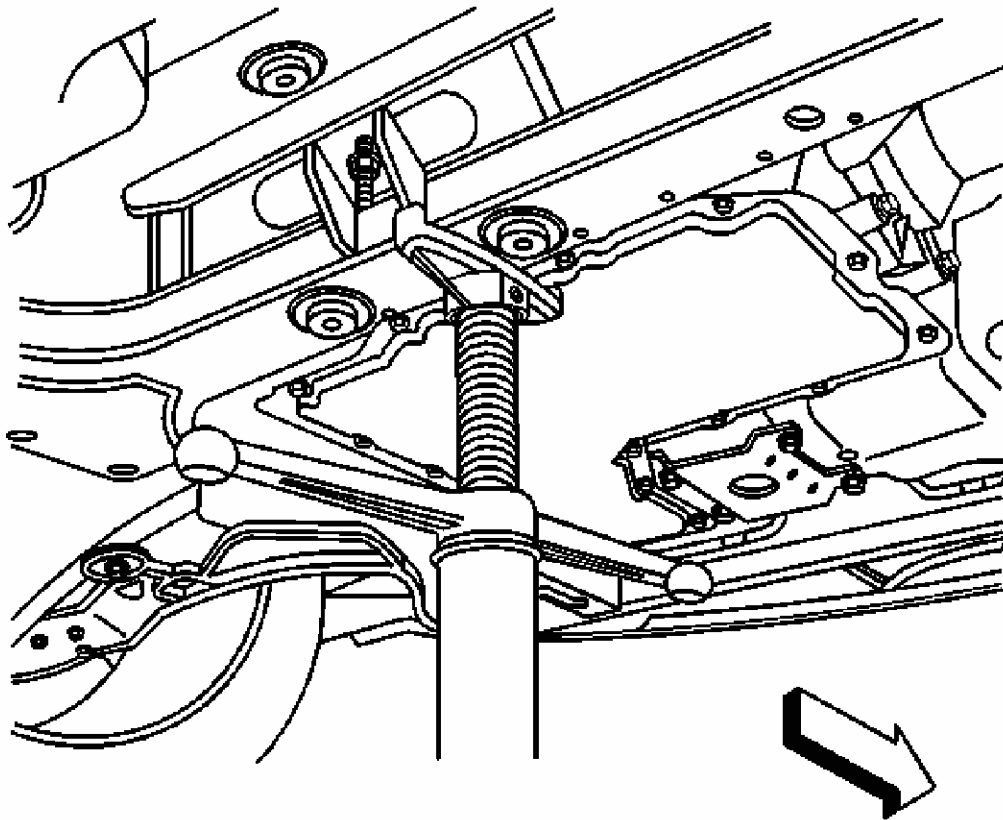


Fig. 49: View Of Proper Support of Engine Frame
Courtesy of GENERAL MOTORS CORP.

19. Support the rear of the frame with a tall screw type jack.

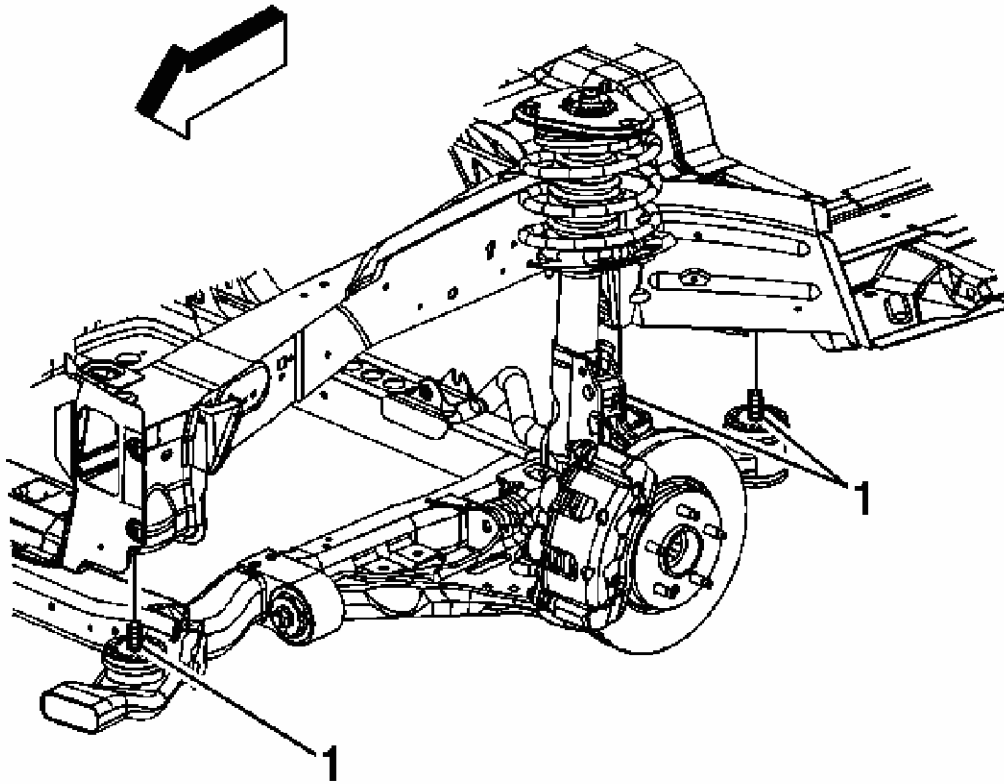


Fig. 50: Identifying Rearward Engine Frame-To-Body Bolts
Courtesy of GENERAL MOTORS CORP.

20. Remove the 4 rearward engine frame-to-body bolts (1) (left side shown, right side similar).
21. Lower the screw type jack approximately 4 cm (1.5 in) allowing the rear of the engine frame to lower.

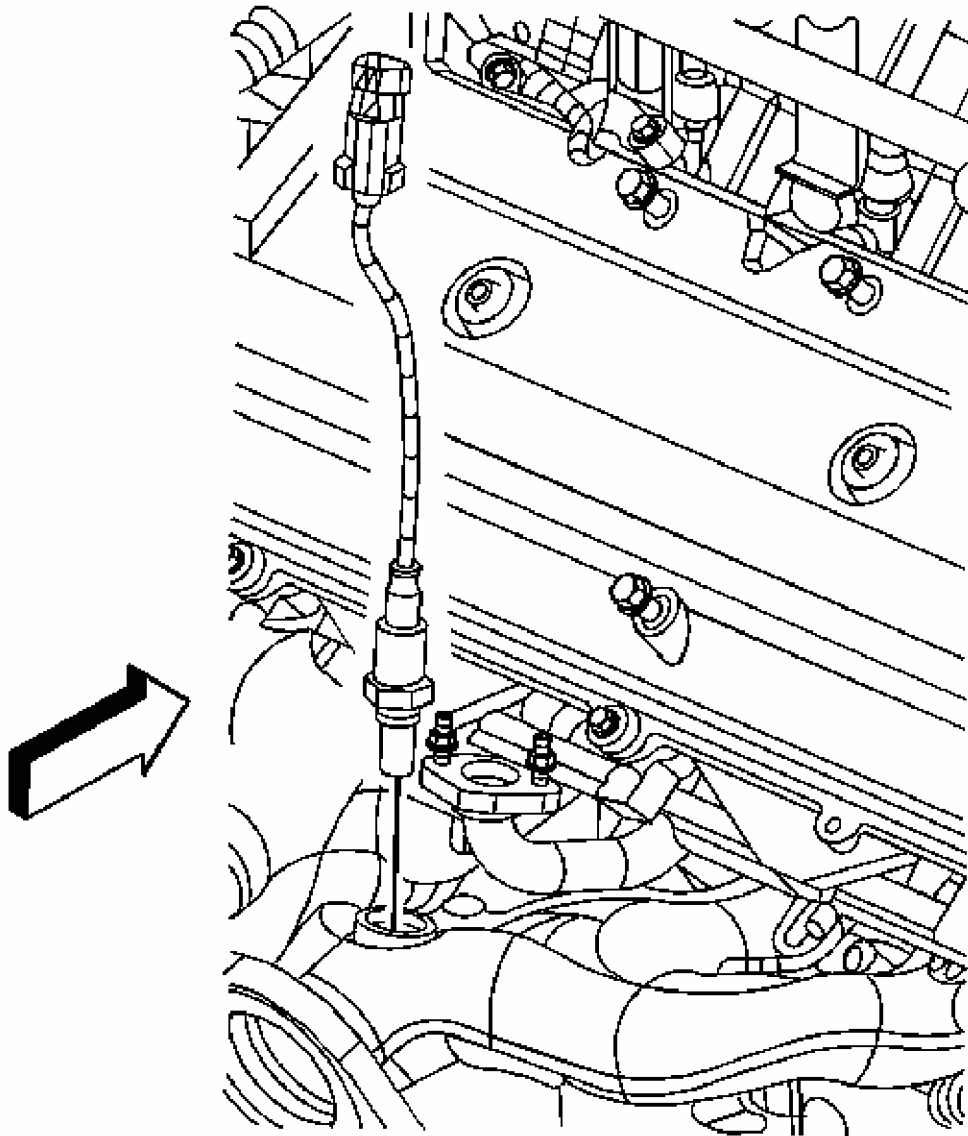


Fig. 51: Removing/Installing HO2S
Courtesy of GENERAL MOTORS CORP.

22. Remove the HO2S.

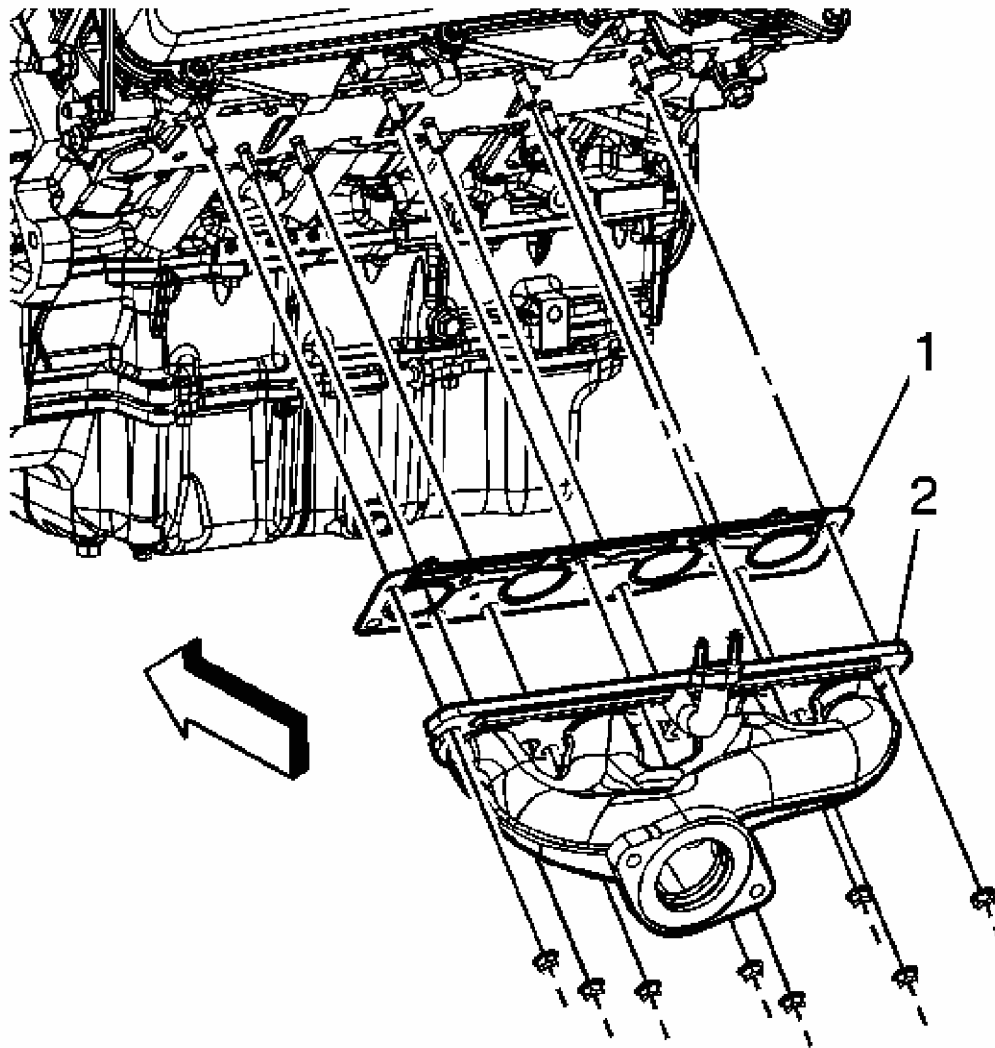


Fig. 52: Removing/Installing Exhaust Manifold & Gasket
Courtesy of GENERAL MOTORS CORP.

23. Remove the exhaust manifold nuts.
24. Remove the exhaust manifold (2).
25. Remove and discard the exhaust manifold gasket (1).

Installation Procedure

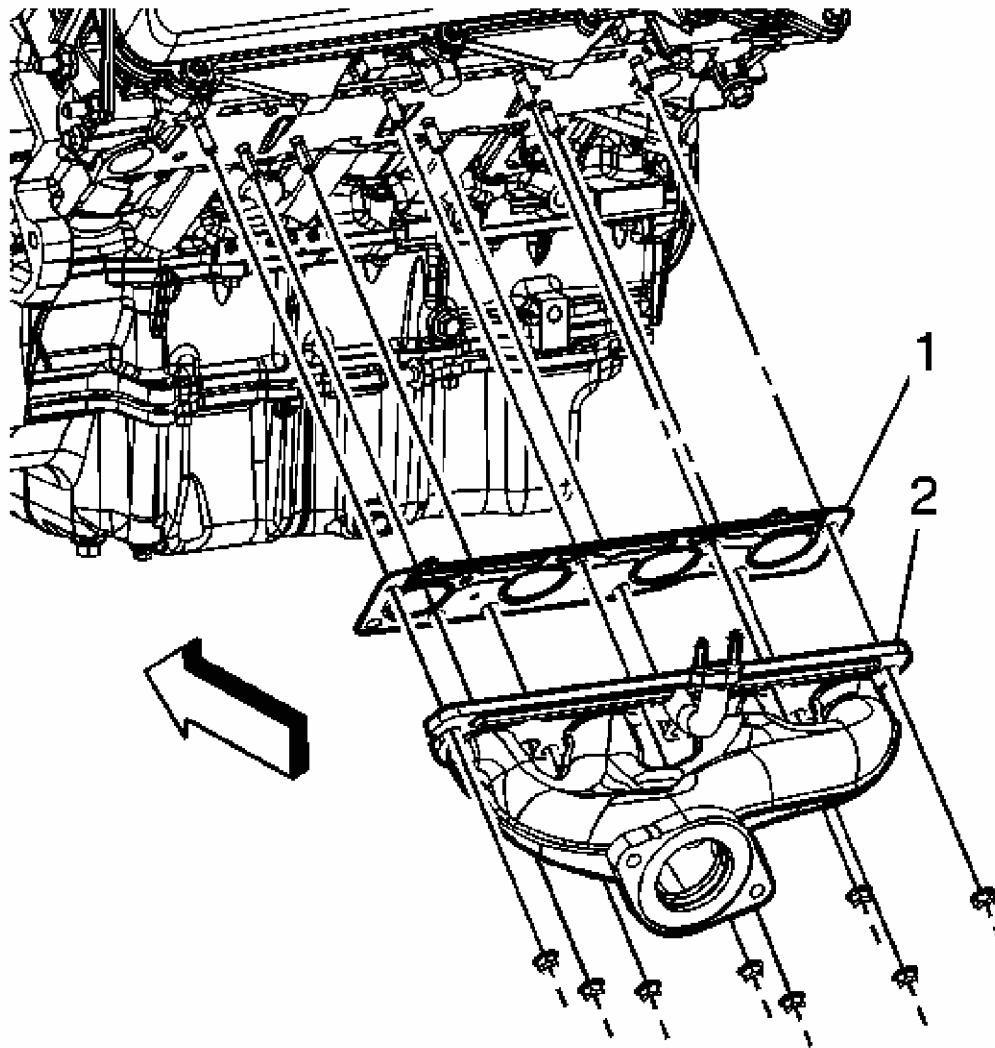


Fig. 53: Removing/Installing Exhaust Manifold & Gasket
Courtesy of GENERAL MOTORS CORP.

1. Install a NEW exhaust manifold gasket (1) onto the cylinder head studs.
2. Install exhaust manifold (2).

NOTE: Refer to Fastener Notice .

3. Install the exhaust manifold nuts.

Tighten: Tighten the nuts to 25 N.m (18 lb ft).

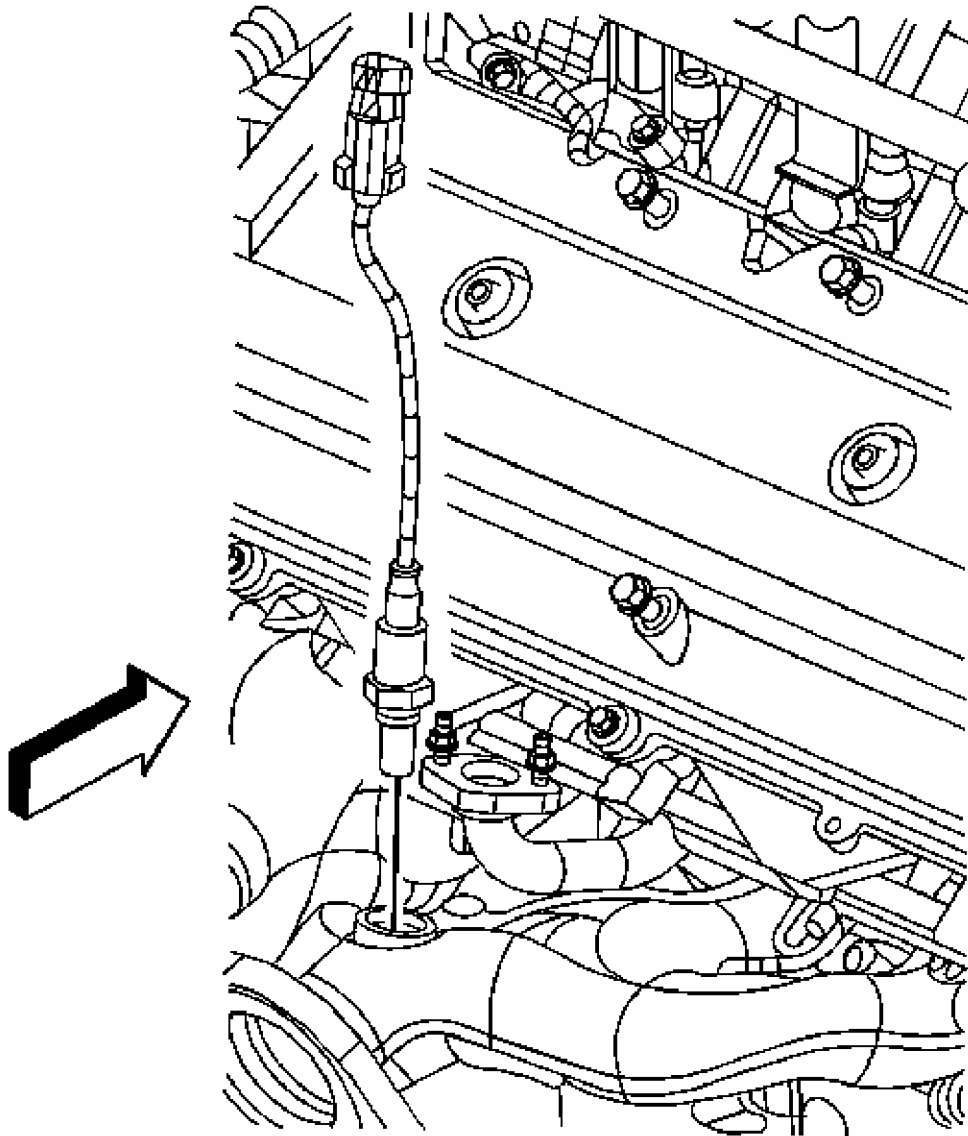


Fig. 54: Removing/Installing HO2S
Courtesy of GENERAL MOTORS CORP.

4. If reusing the old HO2S, coat the threads with anti-seize compound, GM P/N 12377953 or equivalent.
5. Install the HO2S.

Tighten: Tighten the sensor to 41 N.m (30 lb ft).

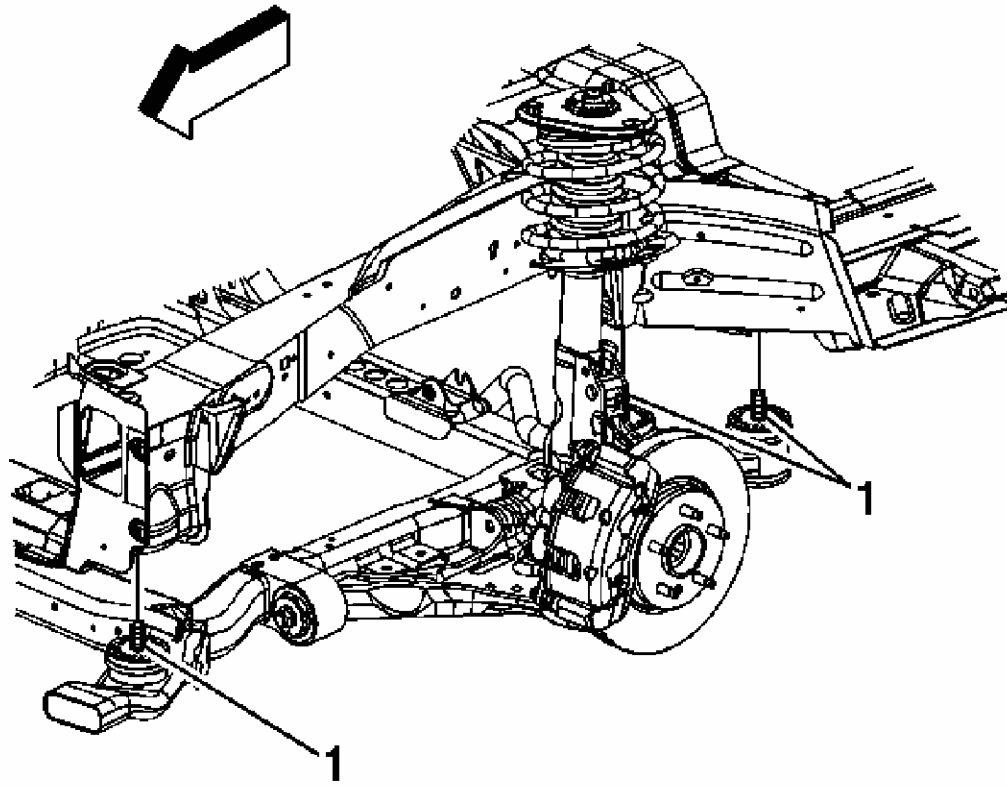


Fig. 55: Identifying Rearward Engine Frame-To-Body Bolts
Courtesy of GENERAL MOTORS CORP.

6. Raise the engine frame into position.
7. Install the 4 rearward engine frame-to-body bolts (1) (left side shown, right side similar).

Tighten: Tighten the bolts to 191 N.m (141 lb ft).

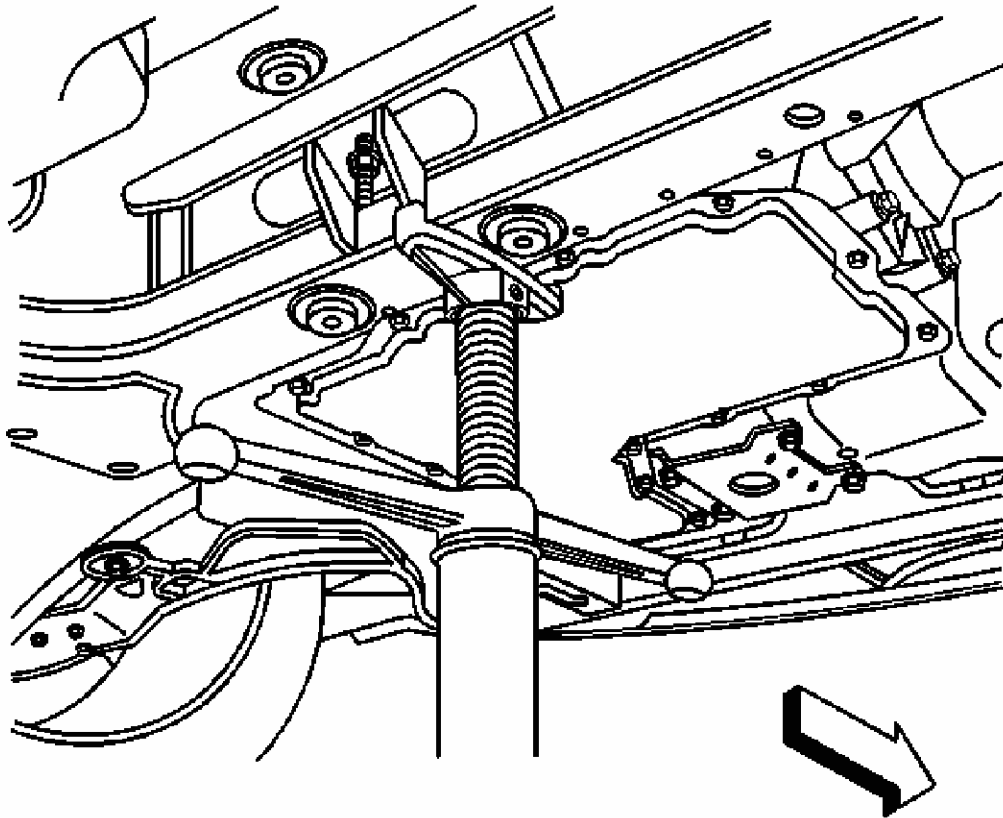


Fig. 56: View Of Proper Support of Engine Frame
Courtesy of GENERAL MOTORS CORP.

8. Remove the screw type jack.

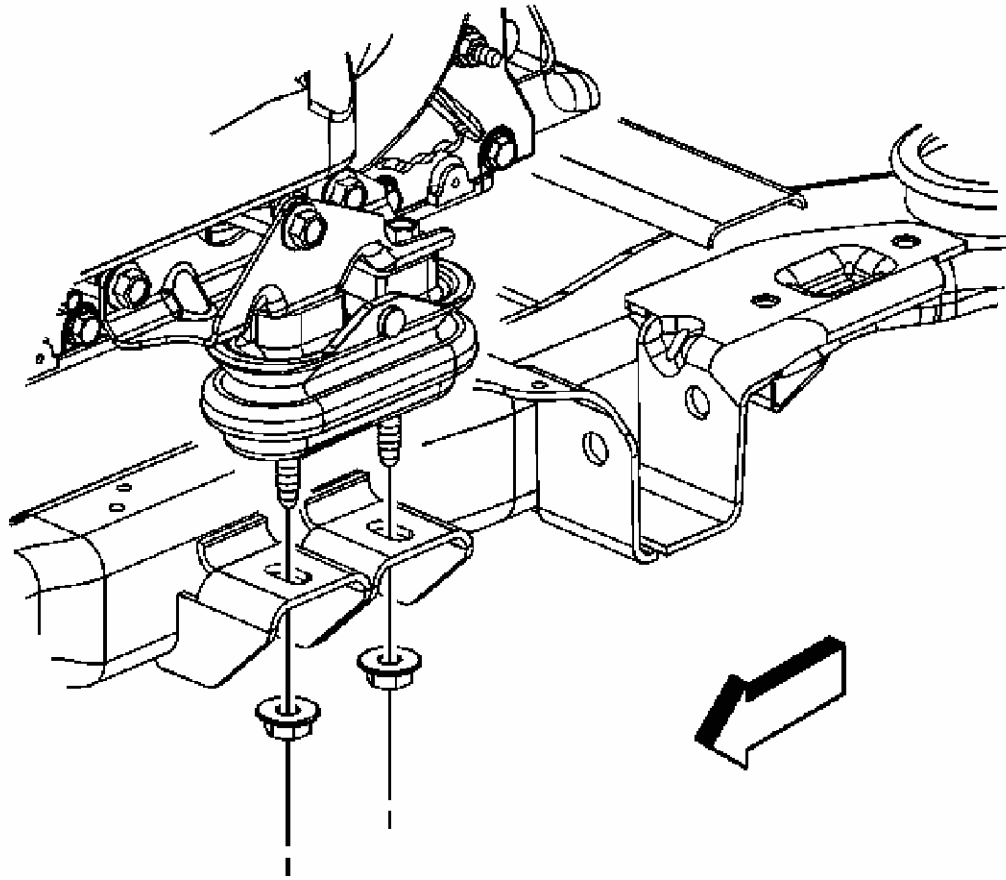


Fig. 57: Identifying Transaxle Mount To Frame Nuts
Courtesy of GENERAL MOTORS CORP.

9. Install the transaxle mount to frame nuts.

Tighten: Tighten the nuts to 50 N.m (37 lb ft).

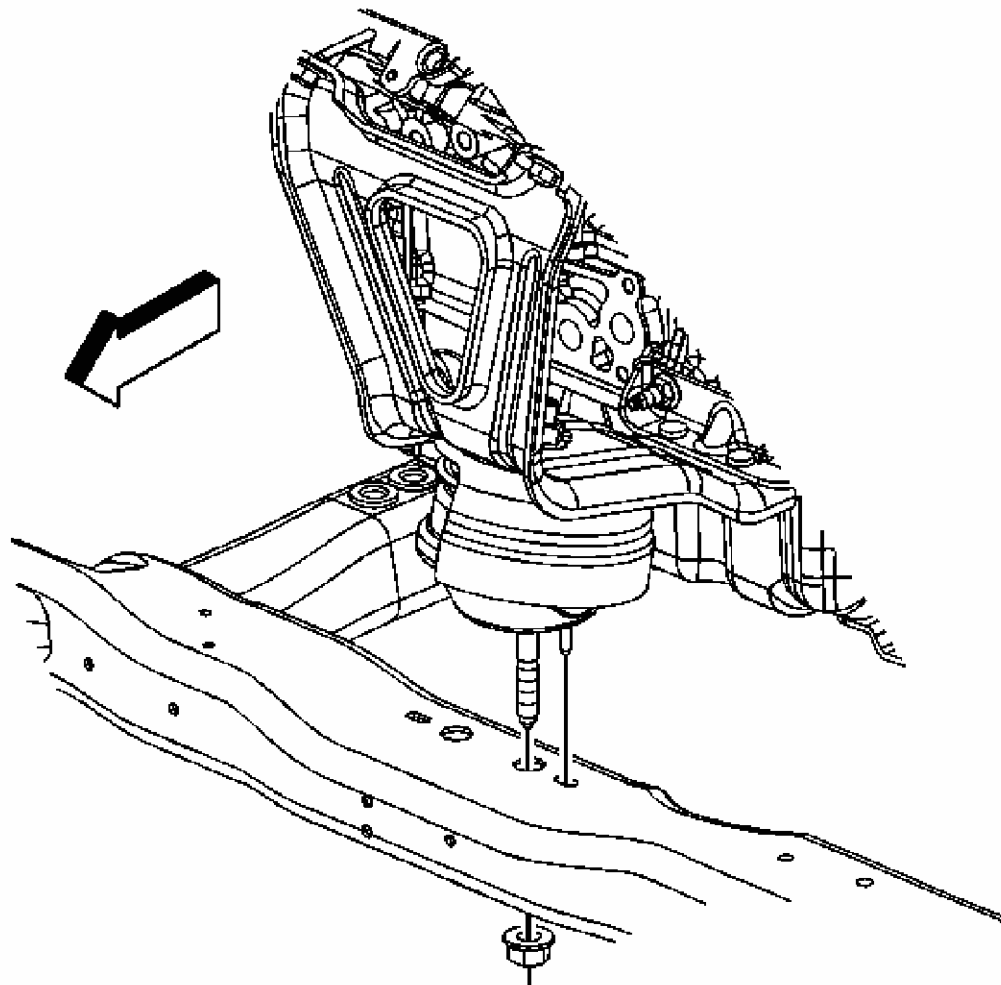


Fig. 58: Identifying Engine Mount To Frame Nut
Courtesy of GENERAL MOTORS CORP.

10. Install the left engine mount to frame nut.

Tighten: Tighten the nuts to 80 N.m (59 lb ft).

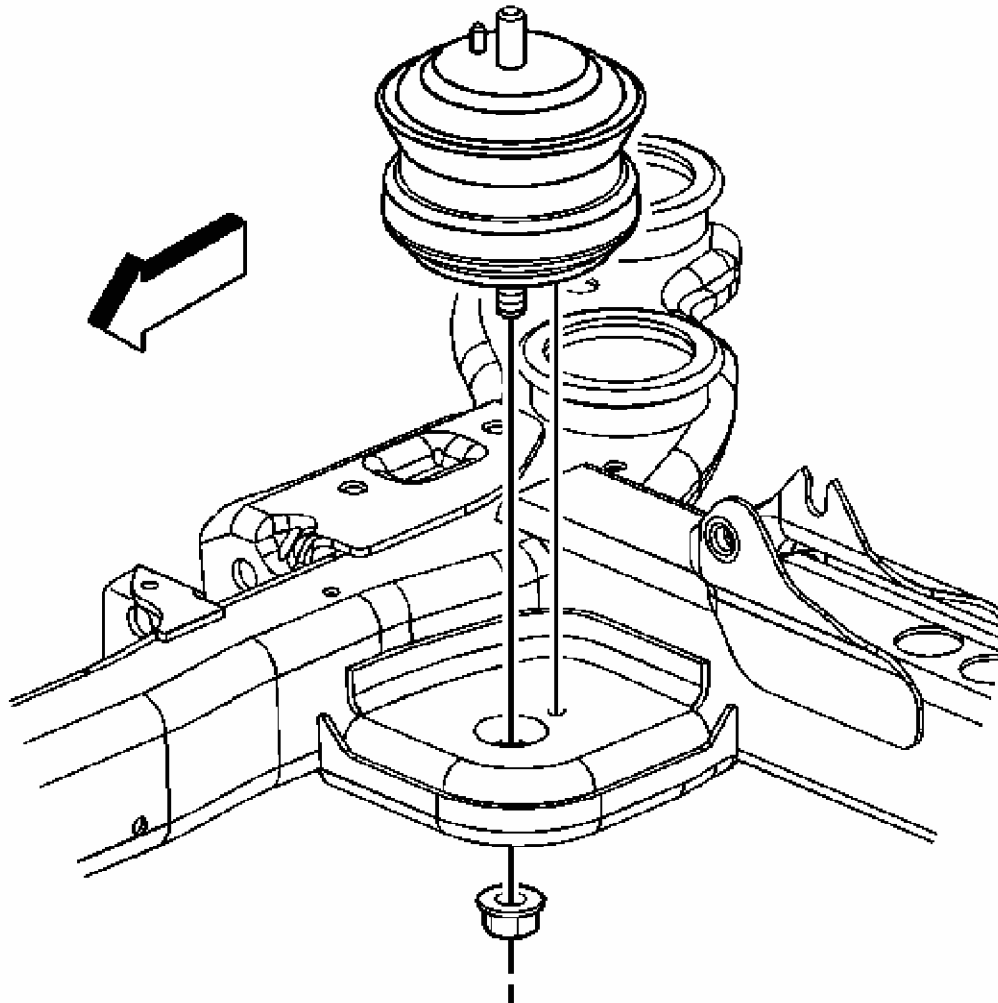


Fig. 59: View Of Right Engine Mount To Frame Nut
Courtesy of GENERAL MOTORS CORP.

11. Install the right engine mount to frame nut.

Tighten: Tighten the nuts to 80 N.m (59 lb ft).

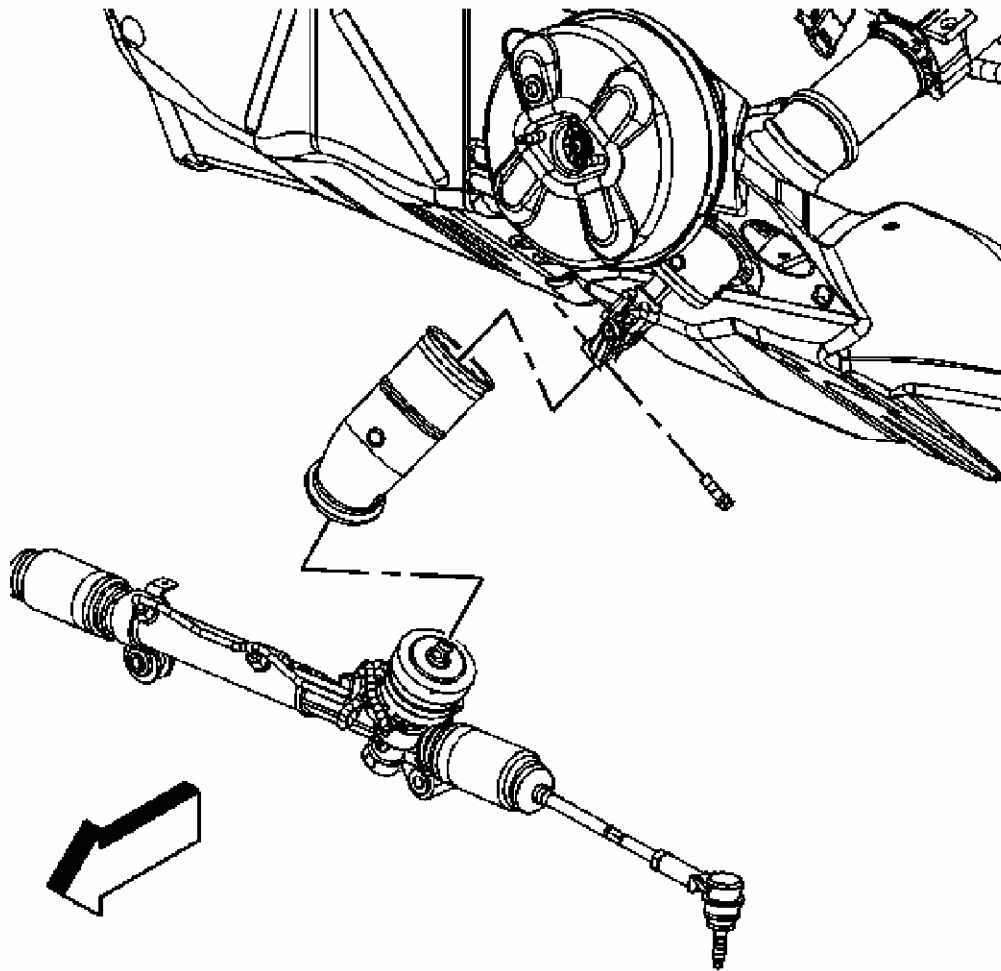


Fig. 60: Identifying Steering Gear & Related Attachments
Courtesy of GENERAL MOTORS CORP.

CAUTION: Failure to disconnect the intermediate shaft from the rack and pinion stub shaft can result in damage to the steering gear and/or damage to the intermediate shaft. This damage may cause loss of steering control which could result in personal injury.

12. Connect the intermediate shaft to the steering gear.
13. Install the intermediate shaft pinch bolt.

Tighten: Tighten the bolt to 45 N.m (33 lb ft).

14. Install the intermediate shaft seal.

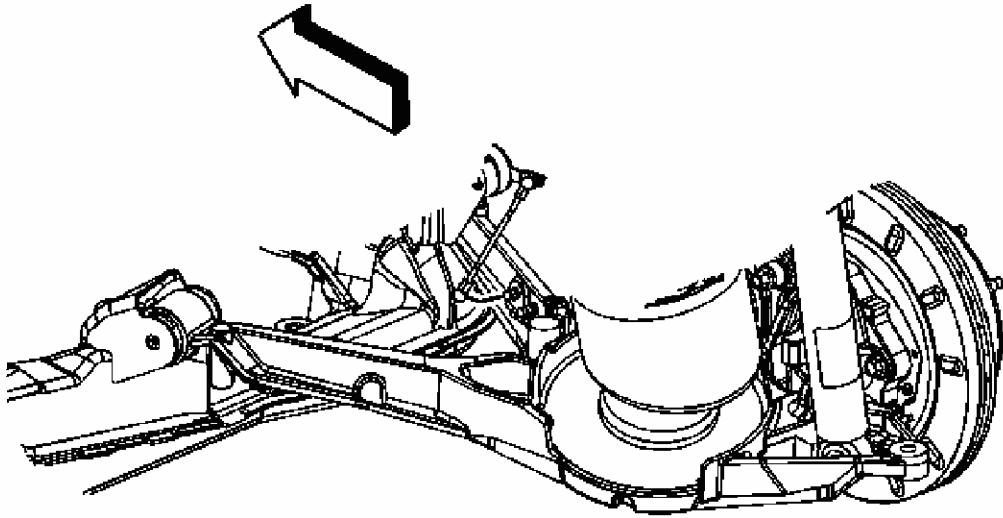


Fig. 61: Identifying Electronic Suspension Front Position Sensor Link
Courtesy of GENERAL MOTORS CORP.

15. Connect the electronic suspension position sensor link ball studs to the lower control arms.

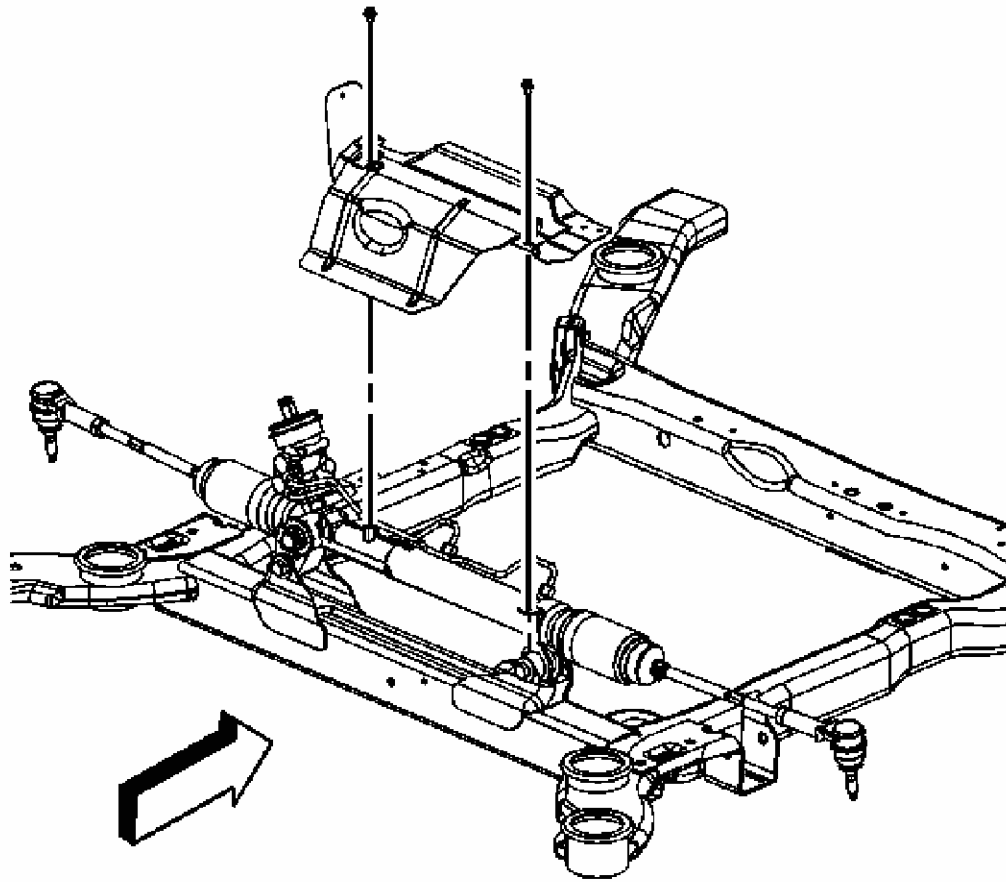


Fig. 62: View Of Steering Gear Heat Shield & Bolts
Courtesy of GENERAL MOTORS CORP.

16. Install the steering gear heat shield.
17. Install the steering gear heat shield bolts.

Tighten: Tighten the bolts to 9 N.m (80 lb in).

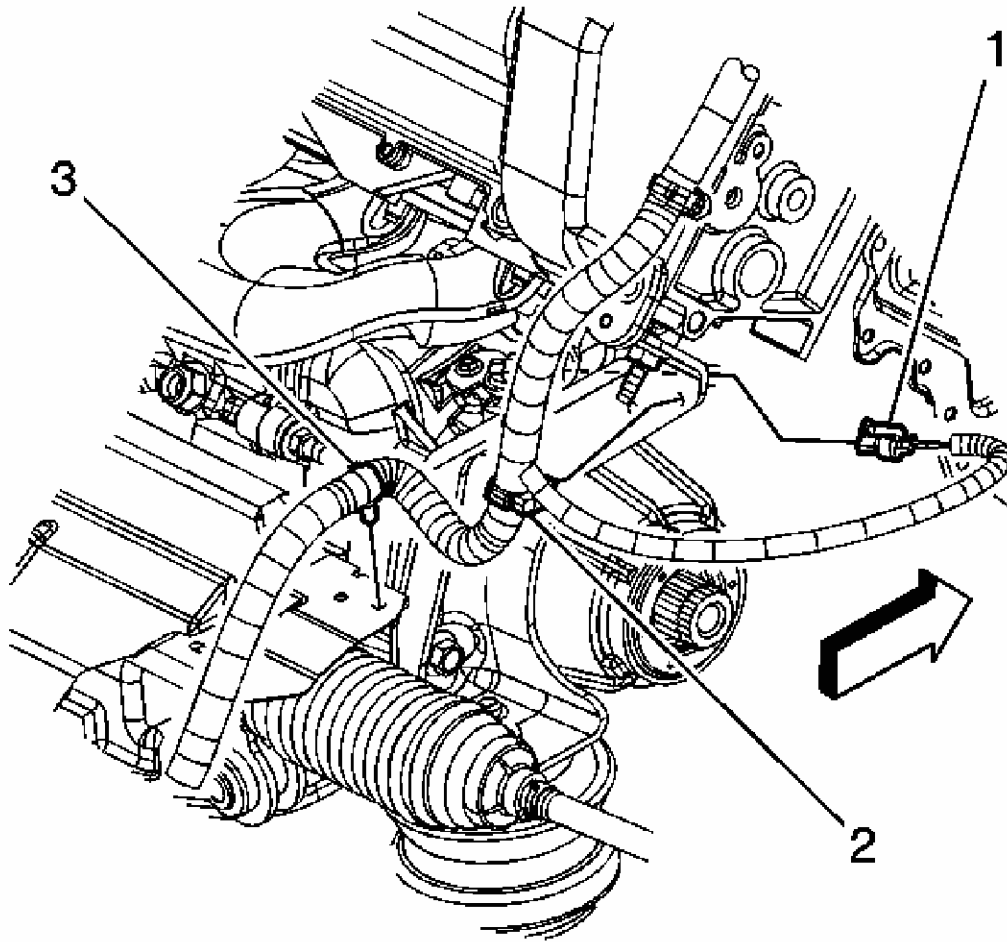


Fig. 63: engine harness clip (3) from the steering gear heat shield
Courtesy of GENERAL MOTORS CORP.

18. Connect the engine harness clip (3) to the steering gear heat shield.

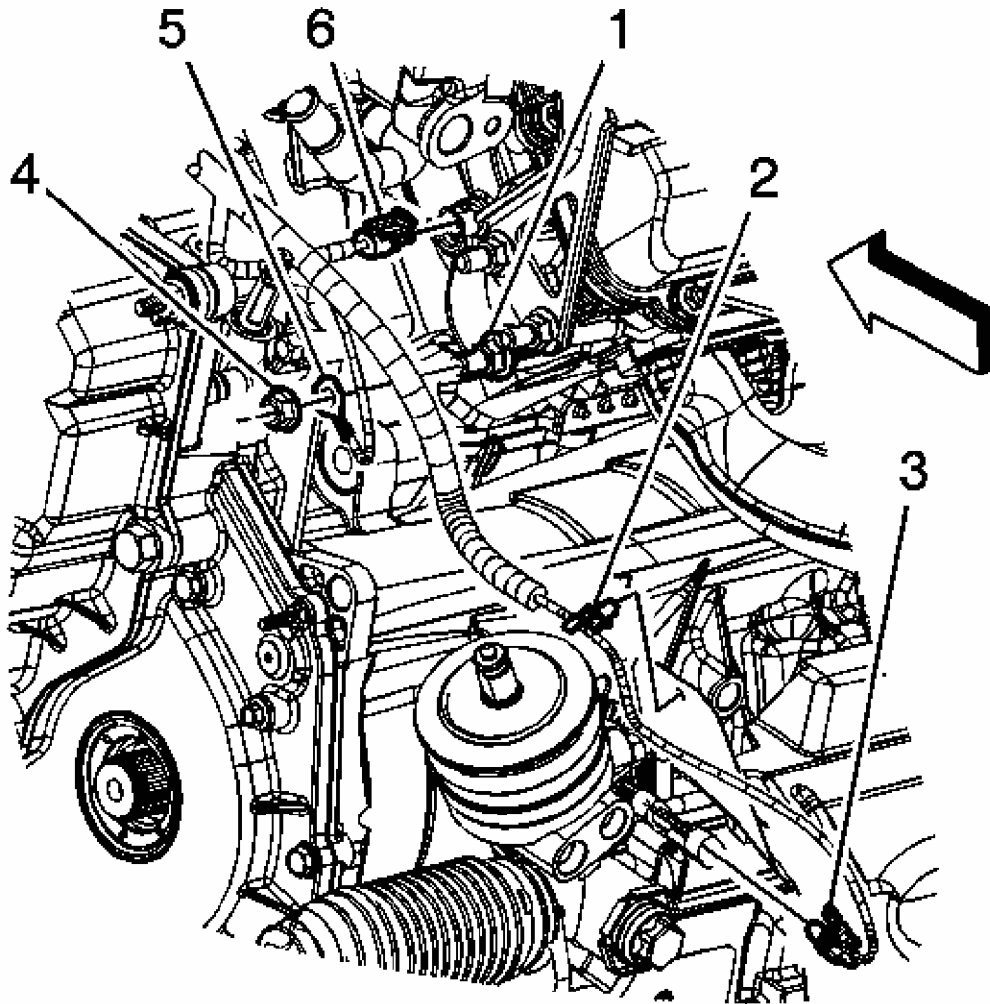


Fig. 64: View Of Engine Harness Clips
Courtesy of GENERAL MOTORS CORP.

19. Connect the engine harness clip (2) to the steering gear heat shield.
20. Install the AIR check valve. Refer to **Secondary Air Injection Check Valve Replacement** .
21. Install the rear exhaust manifold pipe. Refer to **Exhaust Manifold Rear Pipe Replacement (RPO LD8)**.
22. Lower the vehicle.

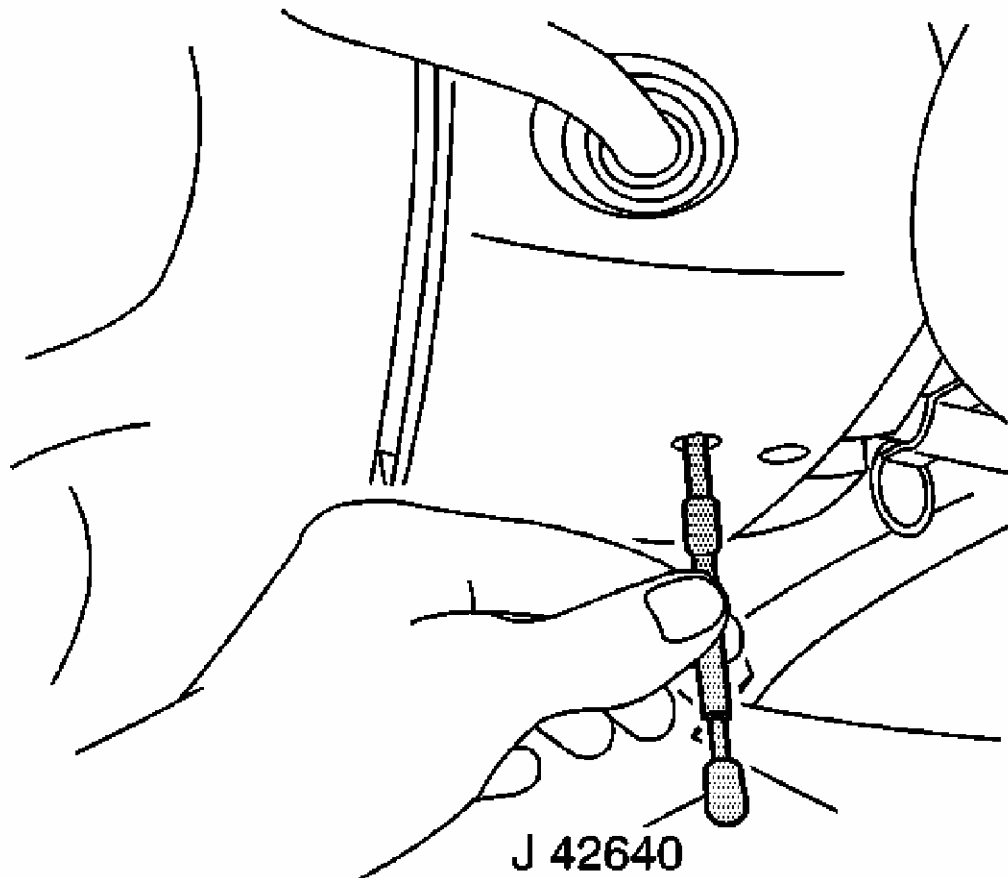


Fig. 65: Identifying J 42640
Courtesy of GENERAL MOTORS CORP.

23. Remove the J 42640 .

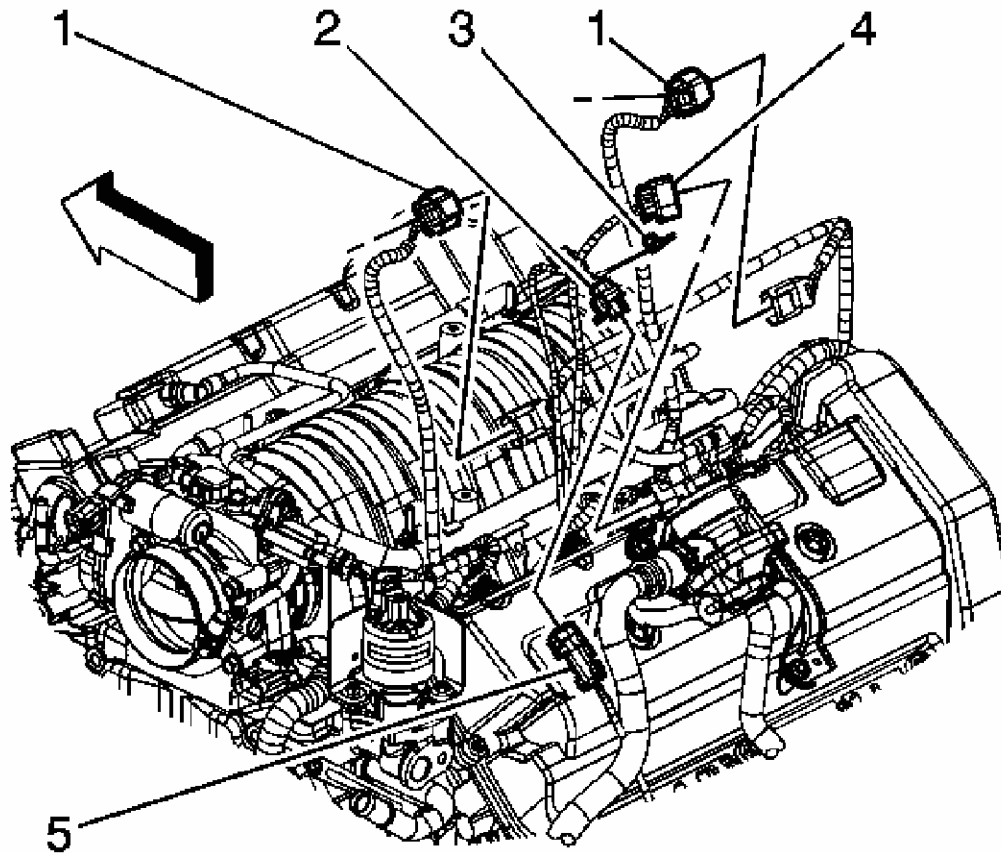


Fig. 66: Identifying Engine Harness Electrical Connectors
Courtesy of GENERAL MOTORS CORP.

24. Connect the engine harness electrical connector (2) to the HO2S.
25. Install the HO2S clip (5) to the AIR valve hose bracket.
26. Install the CPA retainer (3).

EXHAUST MANIFOLD FRONT PIPE REPLACEMENT (RPO LD8)

Removal Procedure

CAUTION: Refer to EXHAUST SERVICE CAUTION .

CAUTION: Refer to PROTECTIVE GOGGLES AND GLOVE CAUTION .

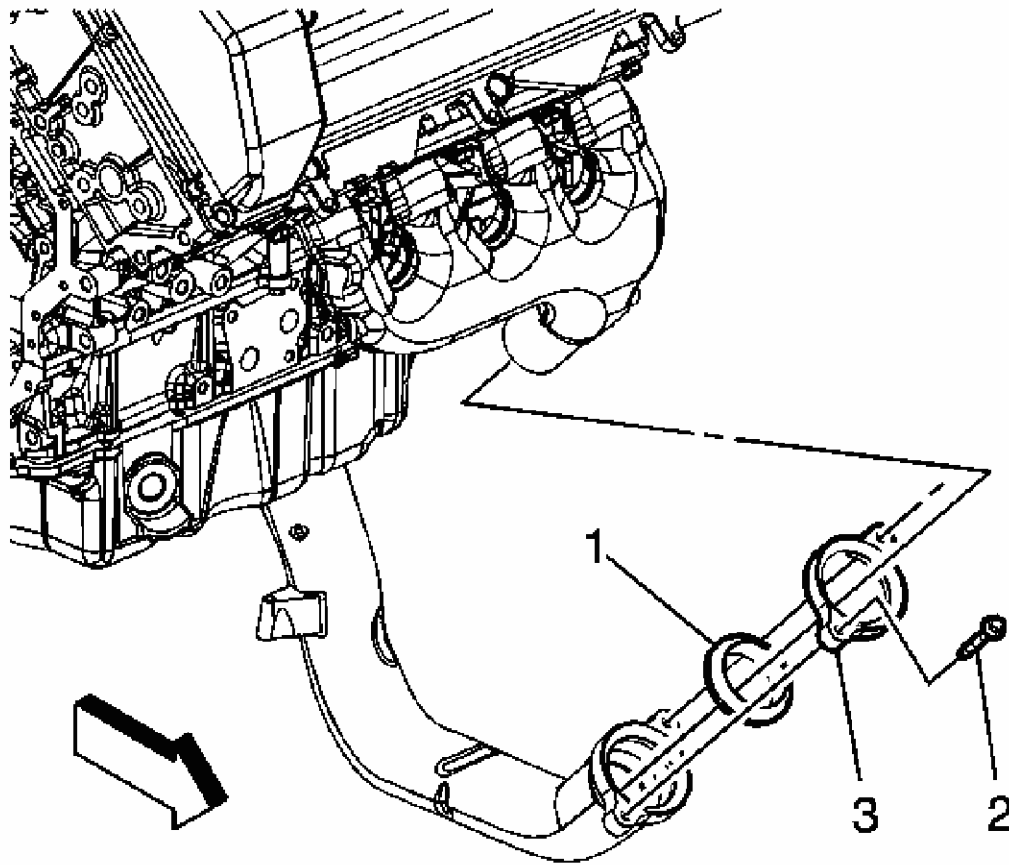


Fig. 67: Identifying Exhaust Manifold Front Pipe Bolts
Courtesy of GENERAL MOTORS CORP.

1. Remove the rear exhaust manifold pipe. Refer to **Exhaust Manifold Rear Pipe Replacement (RPO LD8)**.
2. Remove the transaxle. Refer to **Transmission Replacement**.
3. Remove the front exhaust pipe to exhaust manifold bolts (2).

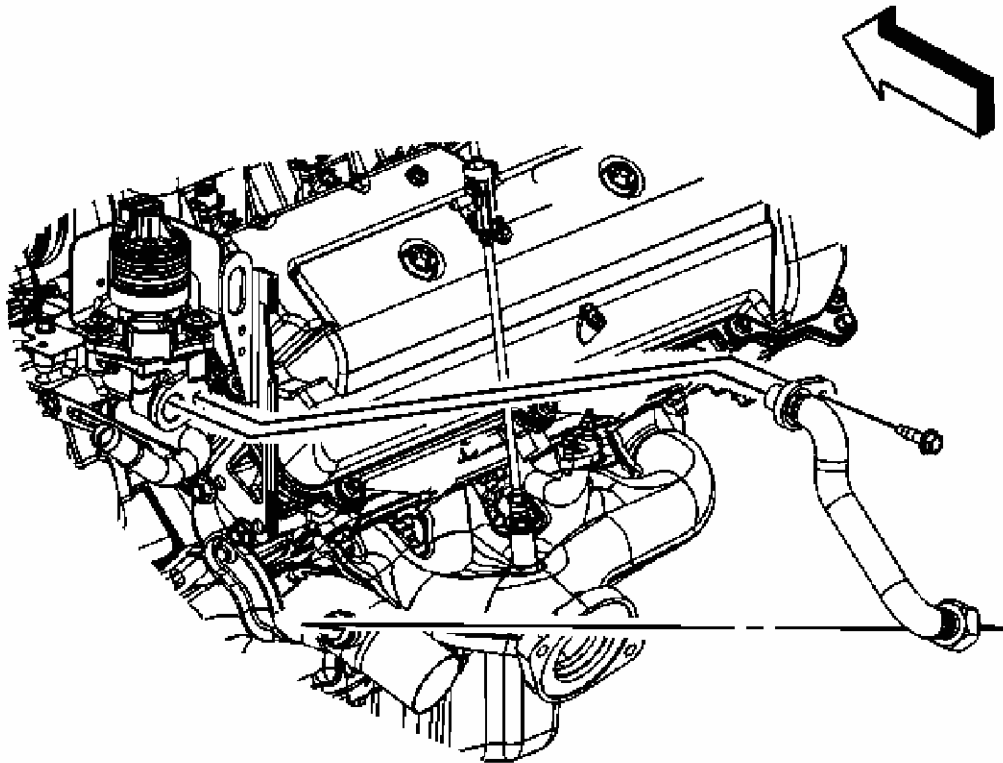


Fig. 68: Identifying EGR Valve Inlet Pipe
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: The EGR valve inlet pipe incorporates a crush seal connection at the water pump housing. The EGR valve inlet pipe must be replaced if disconnected from the water pump housing.

4. Disconnect the EGR inlet pipe nut from the front exhaust manifold pipe.

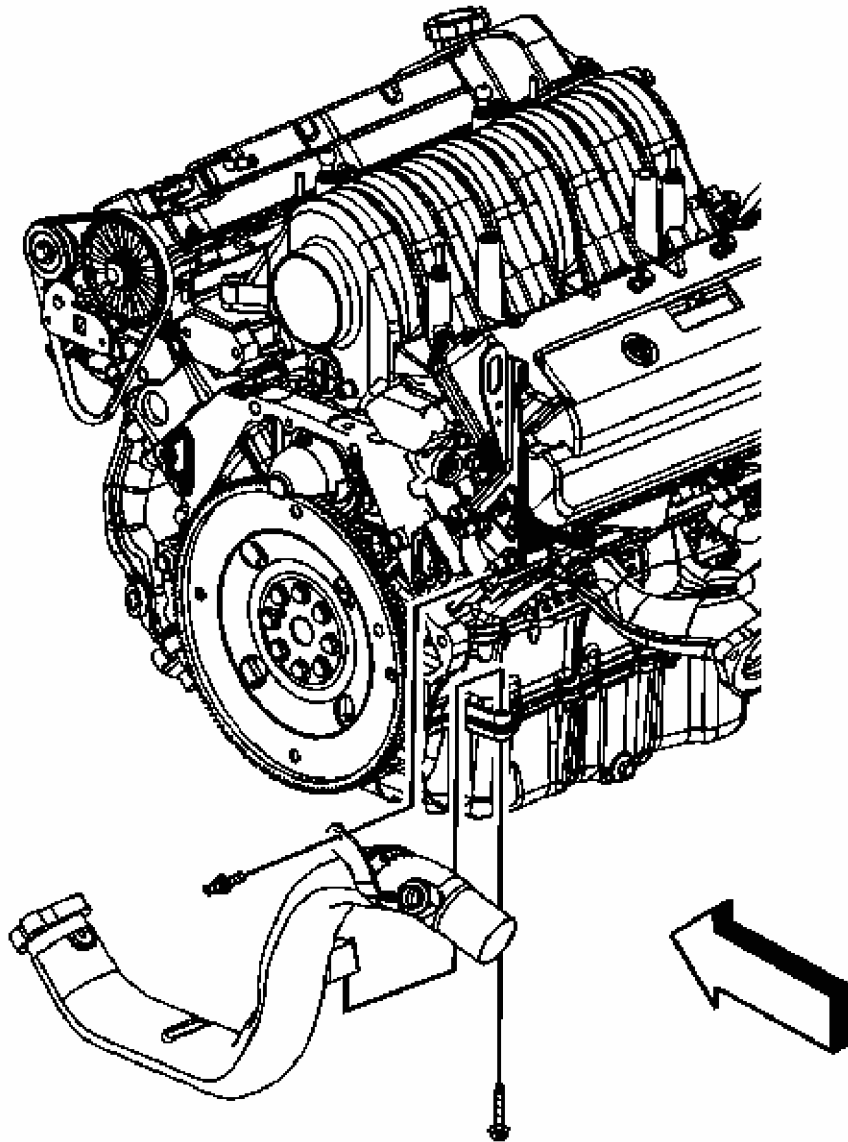


Fig. 69: Identifying Front Exhaust Manifold Pipe
Courtesy of GENERAL MOTORS CORP.

5. Remove the front exhaust manifold pipe to lower crankcase bolt.
6. Remove the front exhaust manifold pipe to cylinder head stud.
7. Remove the front exhaust manifold pipe.
8. Remove the front exhaust manifold pipe seal from the left exhaust manifold and discard the seal.

9. Remove the exhaust manifold flange retainer.

Installation Procedure

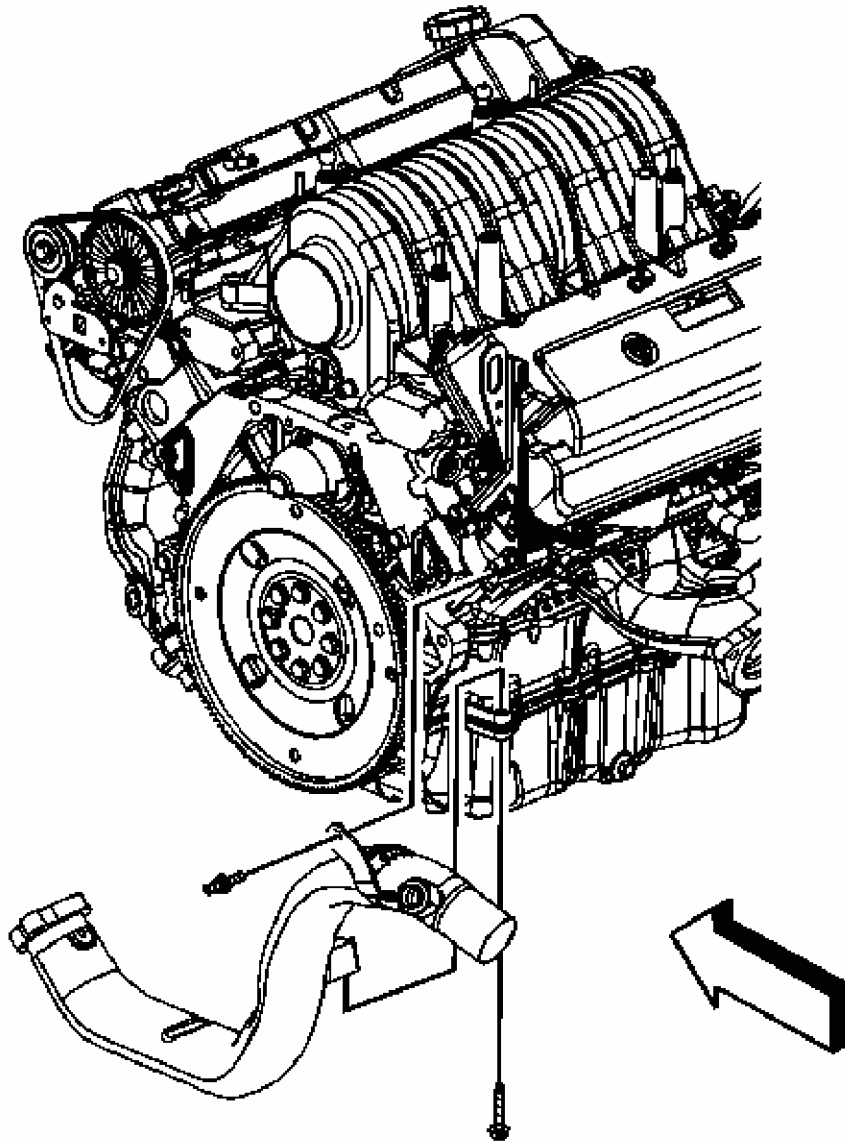


Fig. 70: Identifying Front Exhaust Manifold Pipe
Courtesy of GENERAL MOTORS CORP.

1. Place the retainer and a NEW front exhaust manifold pipe seal over the left exhaust manifold.

2. Insert the front exhaust manifold pipe over the left exhaust manifold.

NOTE: Refer to Fastener Notice .

3. Install the front exhaust manifold pipe to cylinder head stud.

Tighten: Tighten the stud to 25 N.m (18 lb ft).

4. Install the front exhaust manifold pipe to lower crankcase bolt.

Tighten: Tighten the bolt to 25 N.m (18 lb ft).

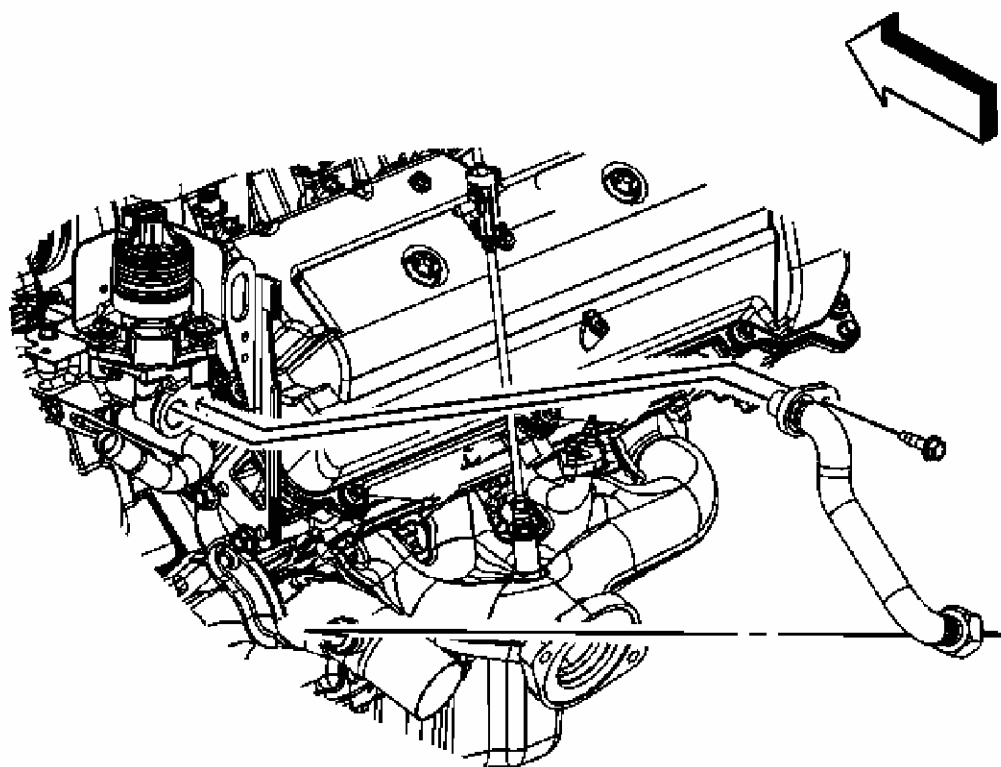


Fig. 71: Identifying EGR Valve Inlet Pipe
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: The EGR valve inlet pipe incorporates a crush seal connection at the water pump housing. The EGR valve inlet pipe must be replaced if disconnected from the water pump housing.

5. Connect the EGR inlet pipe nut to the front exhaust manifold pipe.

Tighten: Tighten the nut to 60 N.m (44 lb ft).

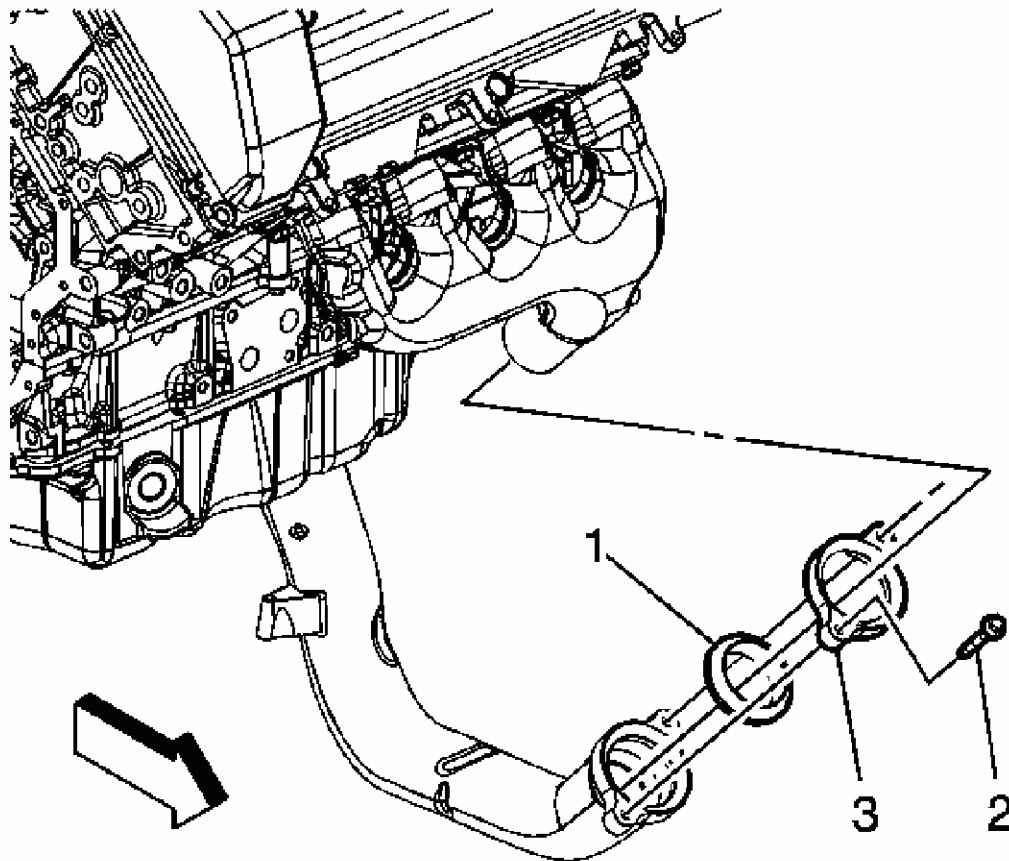


Fig. 72: Identifying Exhaust Manifold Front Pipe Bolts
Courtesy of GENERAL MOTORS CORP.

6. Install the front exhaust pipe to exhaust manifold bolts (2).

Tighten: Tighten the bolts to 25 N.m (18 lb ft).

7. Install the transaxle. Refer to **Transmission Replacement** .
8. Install the rear exhaust manifold pipe. Refer to **Exhaust Manifold Rear Pipe Replacement (RPO LD8)**.

Removal Procedure

CAUTION: Refer to EXHAUST SERVICE CAUTION .

CAUTION: Refer to PROTECTIVE GOGGLES AND GLOVE CAUTION .

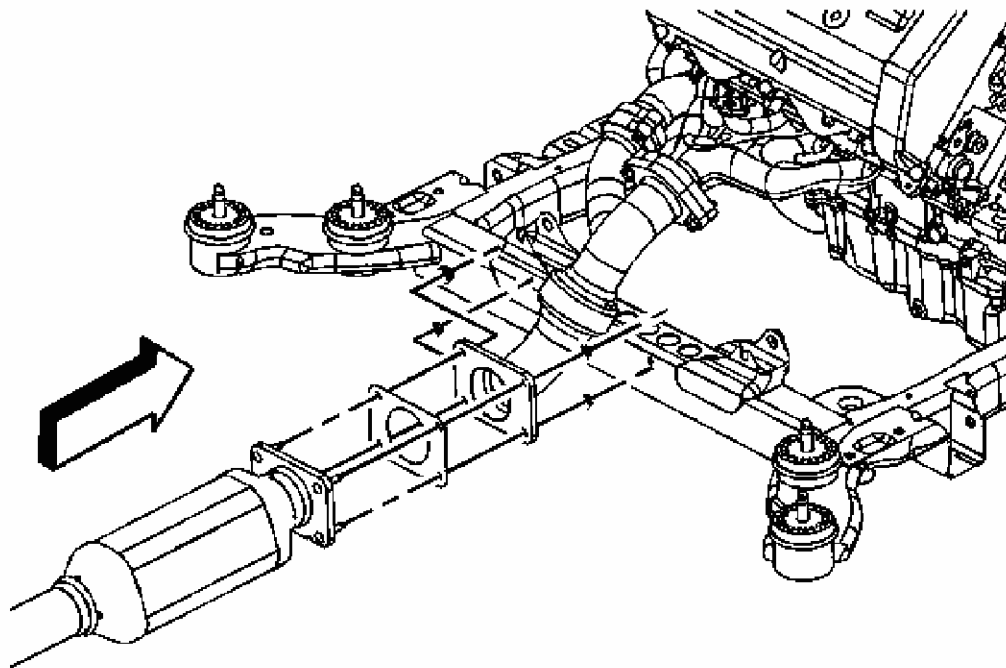


Fig. 73: Identifying Muffler & Rear Exhaust Manifold Pipe Nuts
Courtesy of GENERAL MOTORS CORP.

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .
2. Remove the muffler to rear exhaust manifold pipe nuts.

NOTE: Refer to FLEX DECOUPLER NOTICE .

3. Position the exhaust system rearward, enough to allow the studs located in the muffler to clear the rear exhaust manifold pipe.
4. Remove and discard the muffler to rear exhaust manifold pipe gasket.

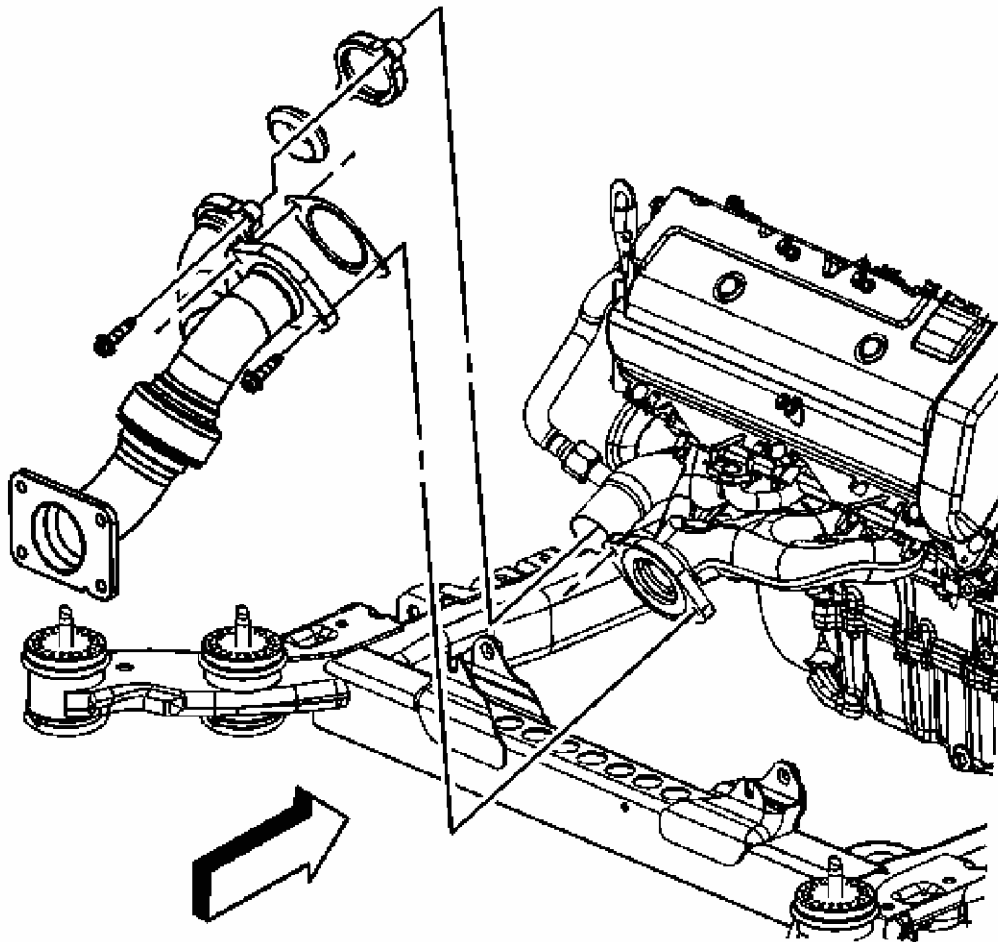


Fig. 74: View Of Rear Exhaust Manifold Pipe & Attachments
Courtesy of GENERAL MOTORS CORP.

5. Remove the rear exhaust manifold pipe to the right exhaust manifold bolts.
6. Remove the rear exhaust manifold pipe to the front exhaust manifold pipe bolts.
7. Remove and discard the rear exhaust manifold pipe gasket.
8. Remove and discard the rear exhaust manifold pipe seal.
9. Remove the rear exhaust manifold pipe flange.

Installation Procedure

NOTE: When inspecting or replacing exhaust system components, make sure there is adequate clearance from all points on the underbody to prevent overheating of the floor pan and possible

damage to the passenger compartment insulation and trim materials.

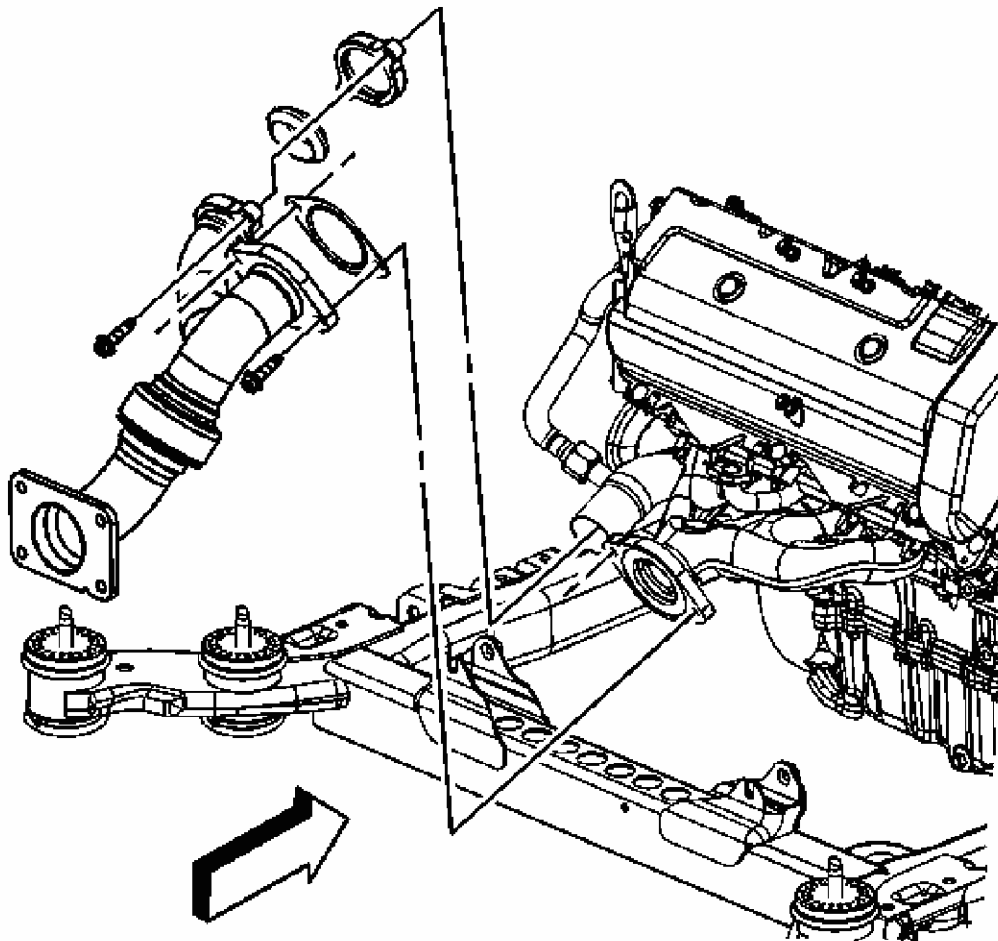


Fig. 75: View Of Rear Exhaust Manifold Pipe & Attachments
Courtesy of GENERAL MOTORS CORP.

1. Install the following components to the rear exhaust manifold pipe.
 1. Position a NEW rear exhaust manifold pipe seal and the rear exhaust manifold pipe flange to the rear exhaust manifold pipe.
 2. Insert and snug the 2 rear exhaust manifold pipe to flange bolts.
 3. Insert the 2 rear exhaust manifold pipe to exhaust manifold bolts.
 4. Place a NEW rear exhaust manifold pipe to exhaust manifold gasket onto the bolts.
2. Install and position the rear exhaust manifold pipe to the front exhaust manifold pipe and

exhaust manifold.

NOTE: Refer to Fastener Notice .

3. Tighten the rear exhaust manifold pipe to exhaust manifold bolts.

Tighten: Tighten the bolts to 40 N.m (30 lb ft).

4. Tighten the rear exhaust manifold pipe to front exhaust manifold pipe bolts.

Tighten: Tighten the bolts to 25 N.m (18 lb ft).

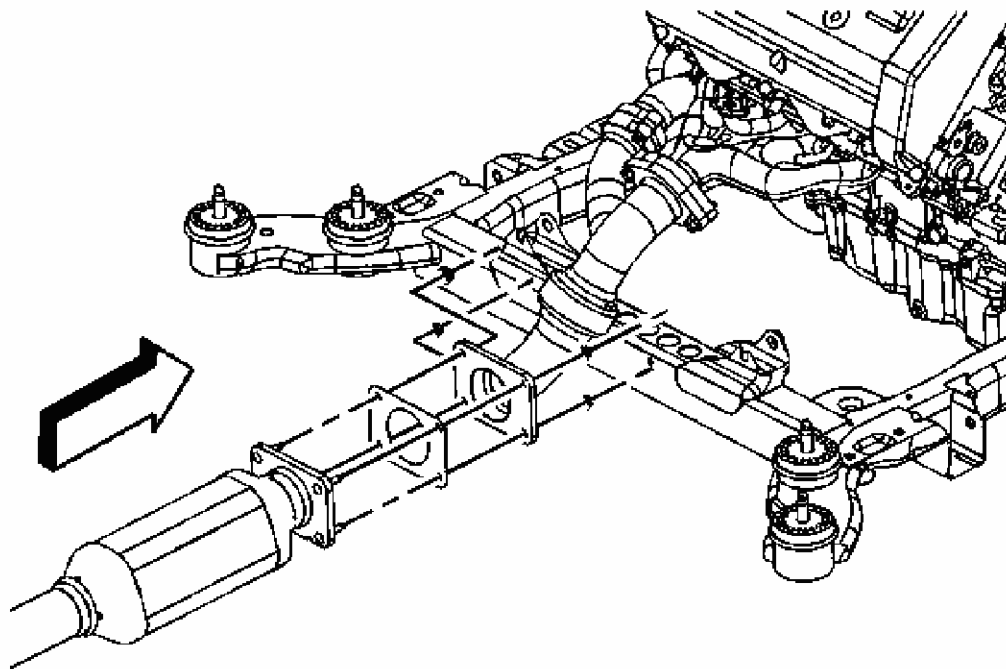


Fig. 76: Identifying Muffler & Rear Exhaust Manifold Pipe Nuts
Courtesy of GENERAL MOTORS CORP.

5. Place a NEW muffler to rear exhaust manifold pipe gasket over the muffler studs.

NOTE: Refer to Flex Decoupler Notice .

6. Position the muffler to the rear exhaust manifold pipe.
7. Install the muffler to rear exhaust manifold pipe nuts.

Tighten: Tighten the nuts to 25 N.m (18 lb ft).

8. Lower the vehicle.

EXHAUST CROSSOVER PIPE REPLACEMENT (RPO L26)

Removal Procedure

CAUTION: Refer to EXHAUST SERVICE CAUTION .

CAUTION: Refer to PROTECTIVE GOGGLES AND GLOVE CAUTION .

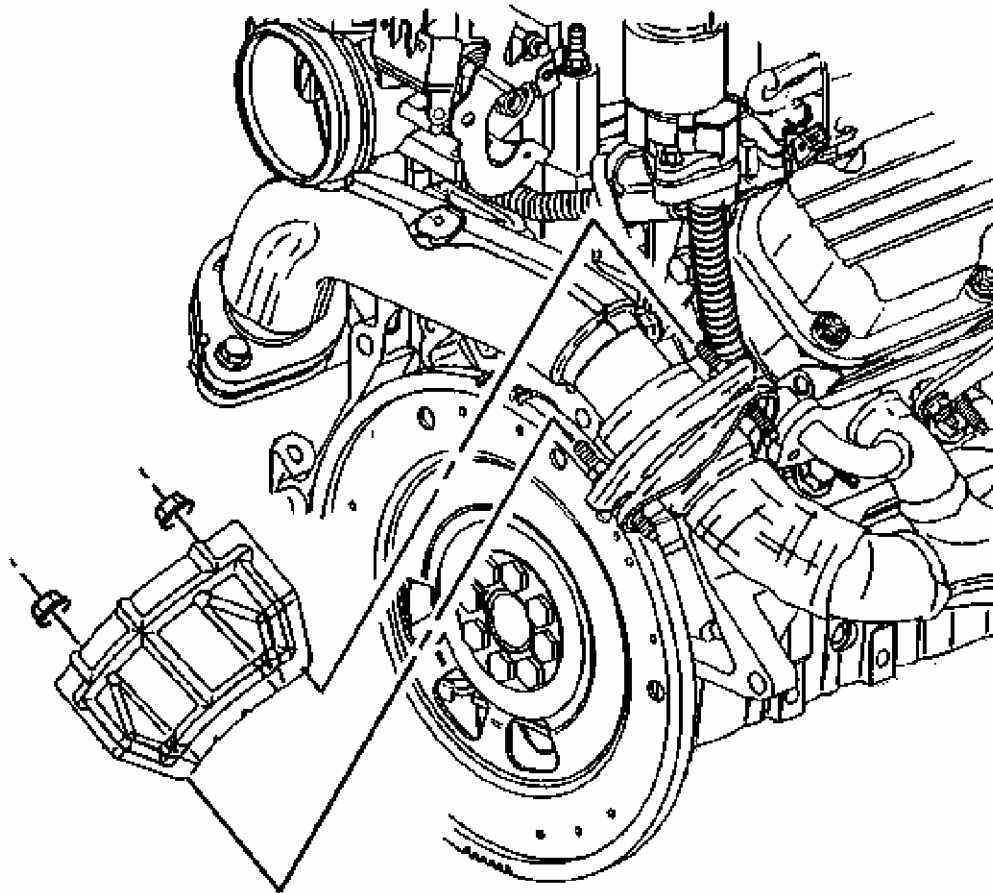


Fig. 77: View Of Exhaust Crossover Heat Shield
Courtesy of GENERAL MOTORS CORP.

1. Remove the intake manifold cover. Refer to **Intake Manifold Cover Replacement** .
2. Remove the air cleaner outlet duct. Refer to **Air Cleaner Outlet Duct Replacement** .
3. Remove the power brake booster heat shield nuts.
4. Remove the power brake booster heat shield.

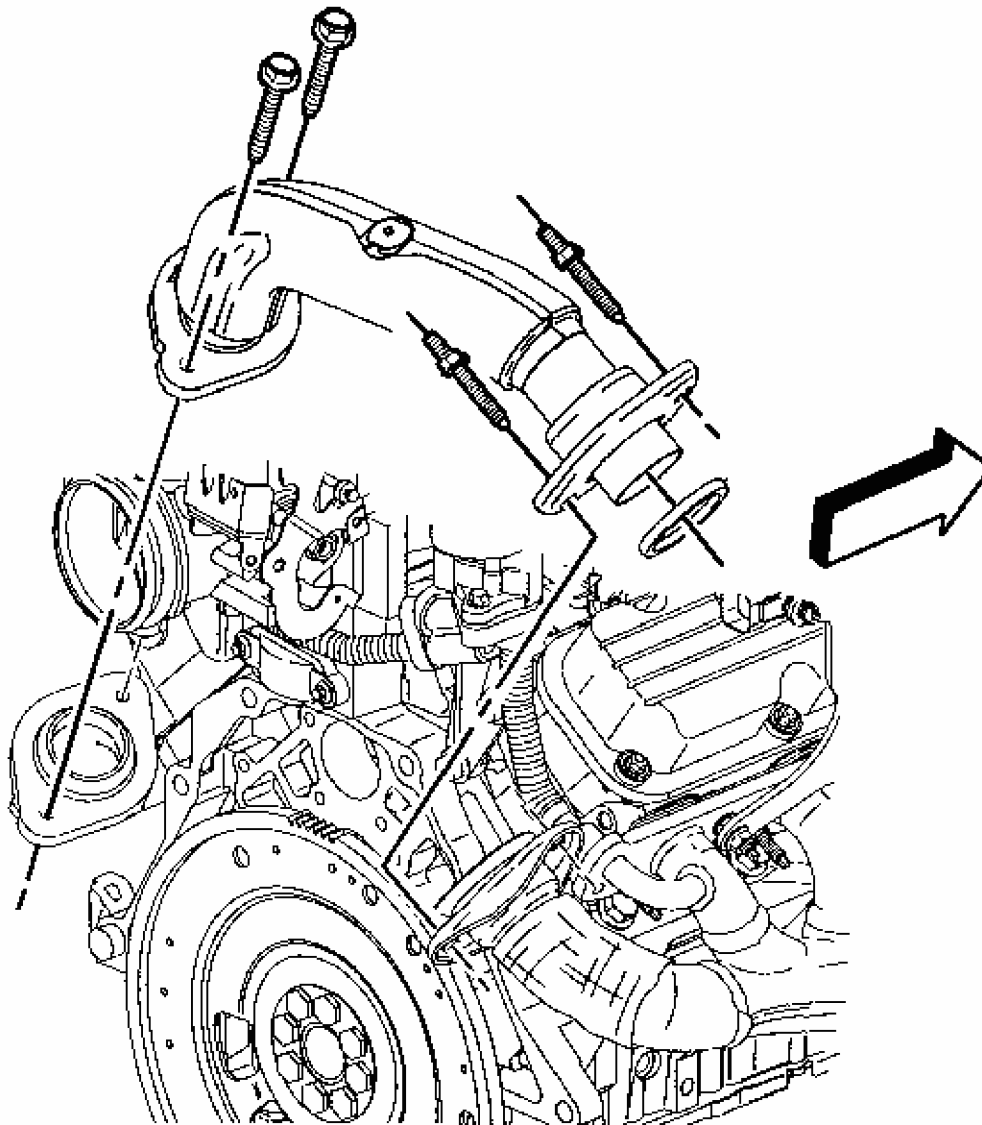


Fig. 78: Removing/Installing Exhaust Crossover
Courtesy of GENERAL MOTORS CORP.

5. Remove the exhaust crossover pipe bolts and studs.

6. Remove the exhaust crossover from the engine.
7. Remove and discard the exhaust crossover pipe seal.

Installation Procedure

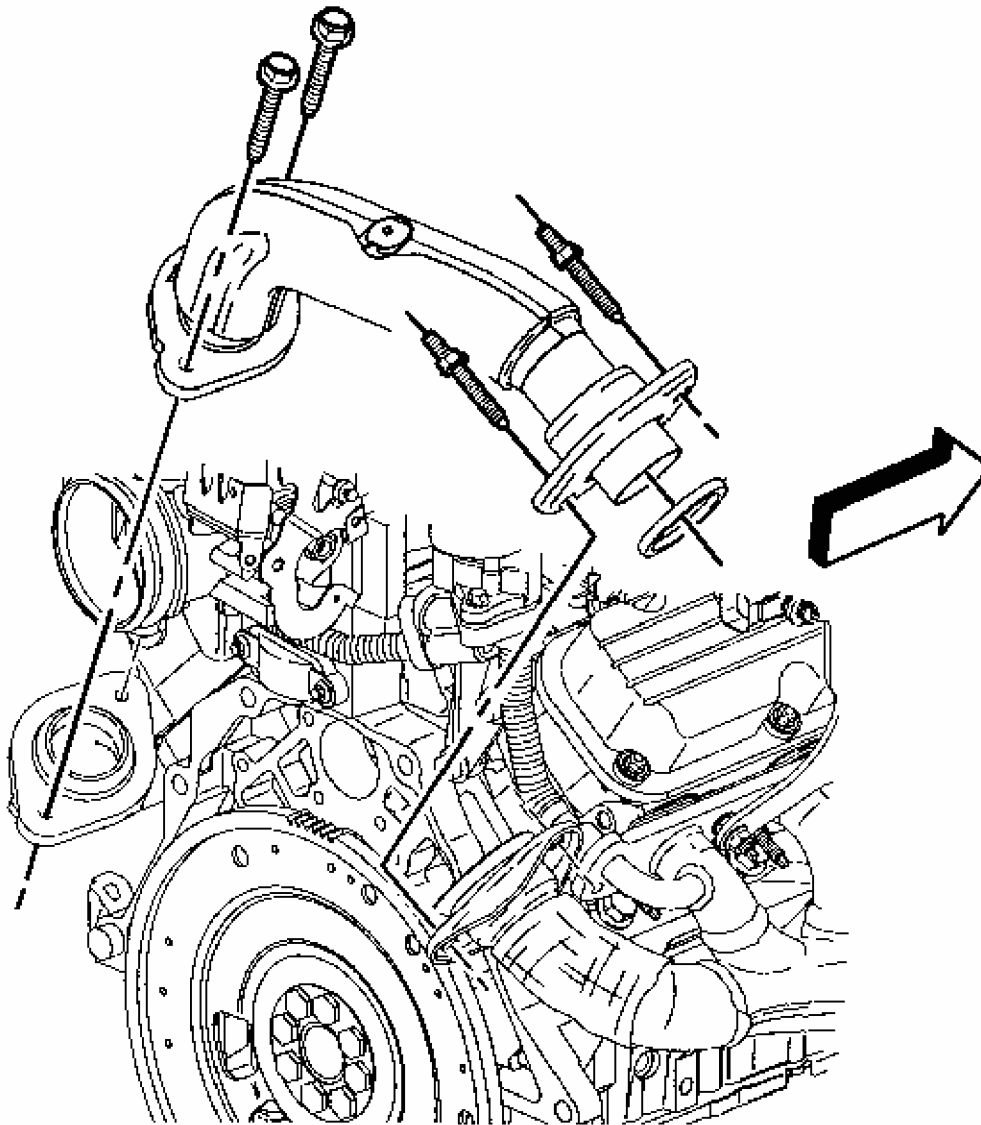


Fig. 79: Removing/Installing Exhaust Crossover
Courtesy of GENERAL MOTORS CORP.

1. Install the NEW exhaust crossover pipe seal into the exhaust crossover pipe.

2. Install the exhaust crossover pipe.

NOTE: Refer to Fastener Notice .

3. Install the exhaust crossover pipe bolts and studs.

Tighten: Tighten the bolts/studs to 18 N.m (13 lb ft).

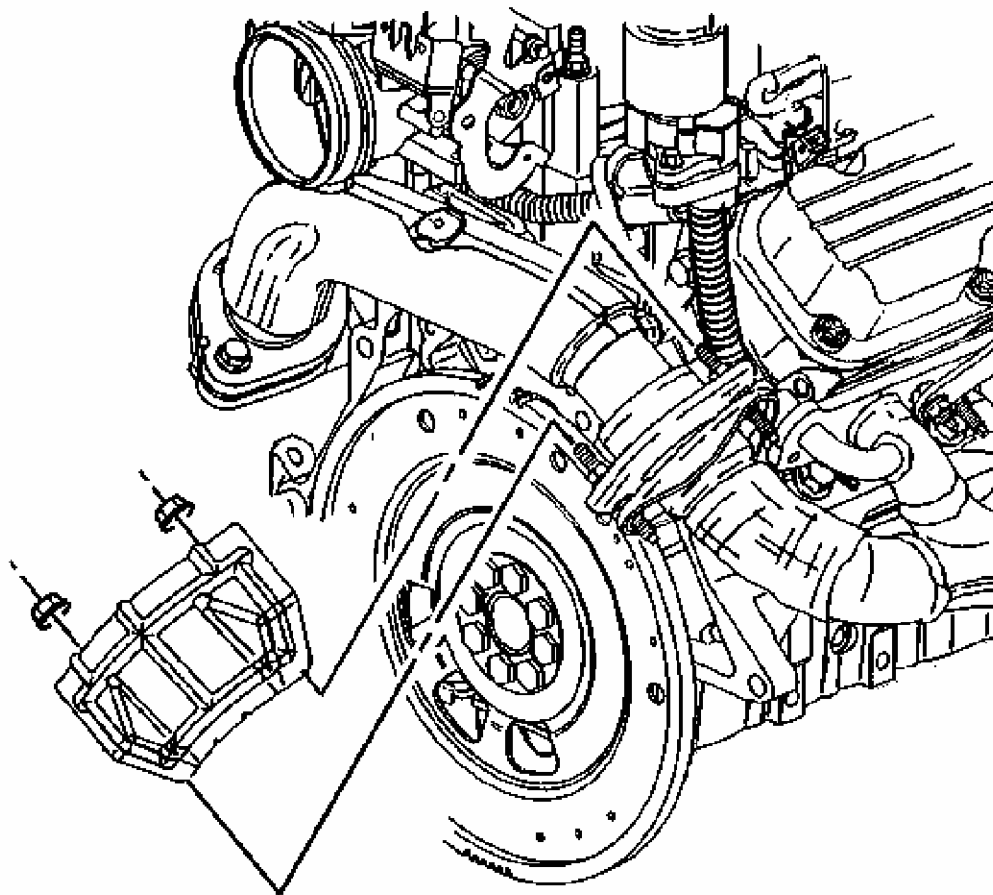


Fig. 80: View Of Exhaust Crossover Heat Shield
Courtesy of GENERAL MOTORS CORP.

4. Install the power brake booster heat shield.
5. Install the power brake booster heat shield nuts.

Tighten: Tighten the nuts to 20 N.m (15 lb ft).

6. Remove the air cleaner outlet duct. Refer to **Air Cleaner Outlet Duct Replacement** .
7. Remove the intake manifold cover. Refer to **Intake Manifold Cover Replacement** .

EXHAUST SYSTEM REPLACEMENT (RPO L26)

Removal Procedure

CAUTION: Refer to **EXHAUST SERVICE CAUTION** .

CAUTION: Refer to **PROTECTIVE GOGGLES AND GLOVE CAUTION** .

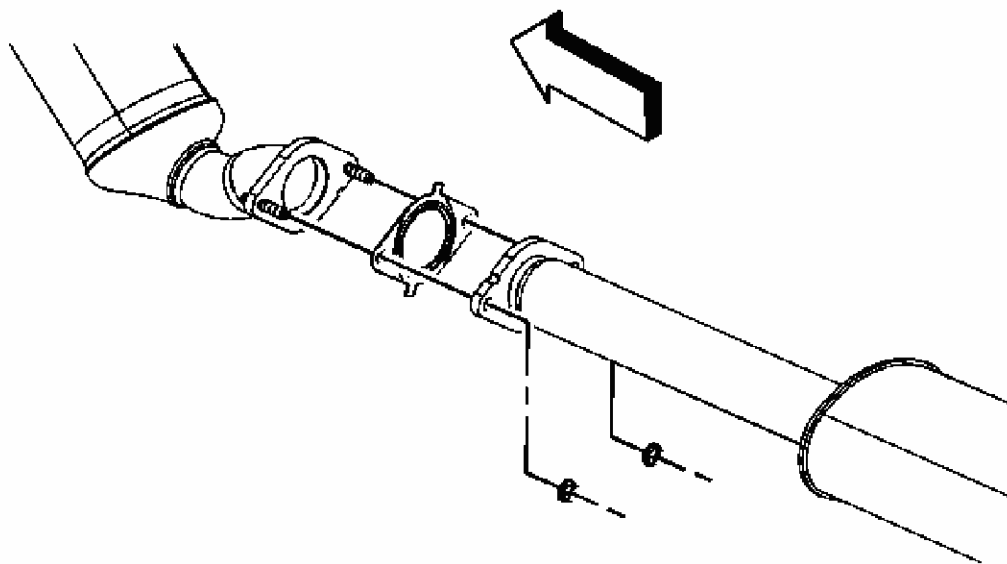


Fig. 81: Disconnecting/Reconnecting Muffler To Catalytic Converter Nuts
Courtesy of GENERAL MOTORS CORP.

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the muffler to catalytic converter nuts.
3. Suitably support the exhaust system.

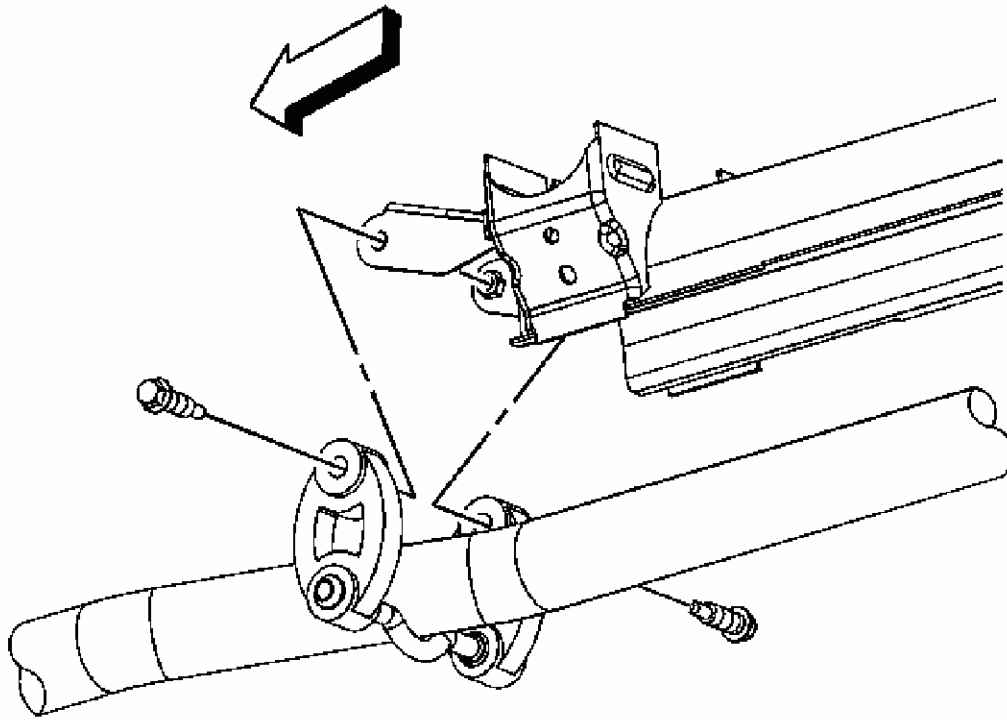


Fig. 82: View Of Center Exhaust Hanger Bolts
Courtesy of GENERAL MOTORS CORP.

4. Remove the center exhaust hanger to the rear suspension support bracket bolts.

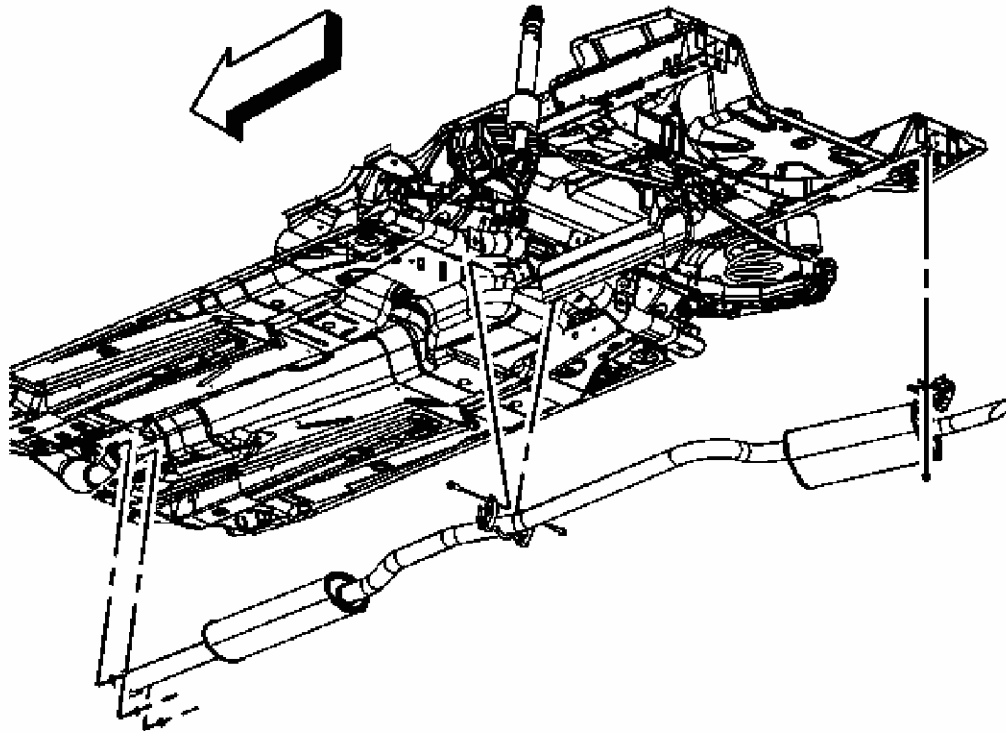


Fig. 83: Identifying Exhaust System Mounting Points
Courtesy of GENERAL MOTORS CORP.

5. Remove the rear exhaust hanger bracket to rear compartment rail bolt.
6. With the aid of an assistant, lower and remove the exhaust system.
7. Remove and discard the catalytic converter to muffler gasket.

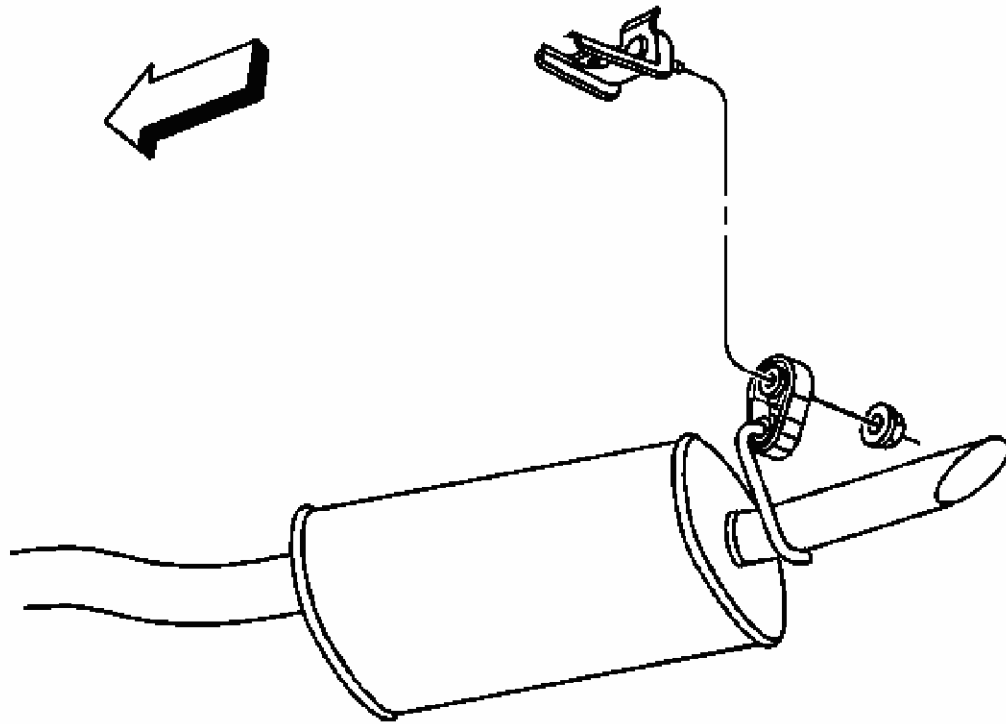


Fig. 84: Removing/Installing Rear Exhaust Hanger (Single Muffler System)
Courtesy of GENERAL MOTORS CORP.

8. Remove the rear exhaust hanger to exhaust hanger bracket nut.
9. Remove the rear exhaust hanger bracket from the rear exhaust hanger.

Installation Procedure

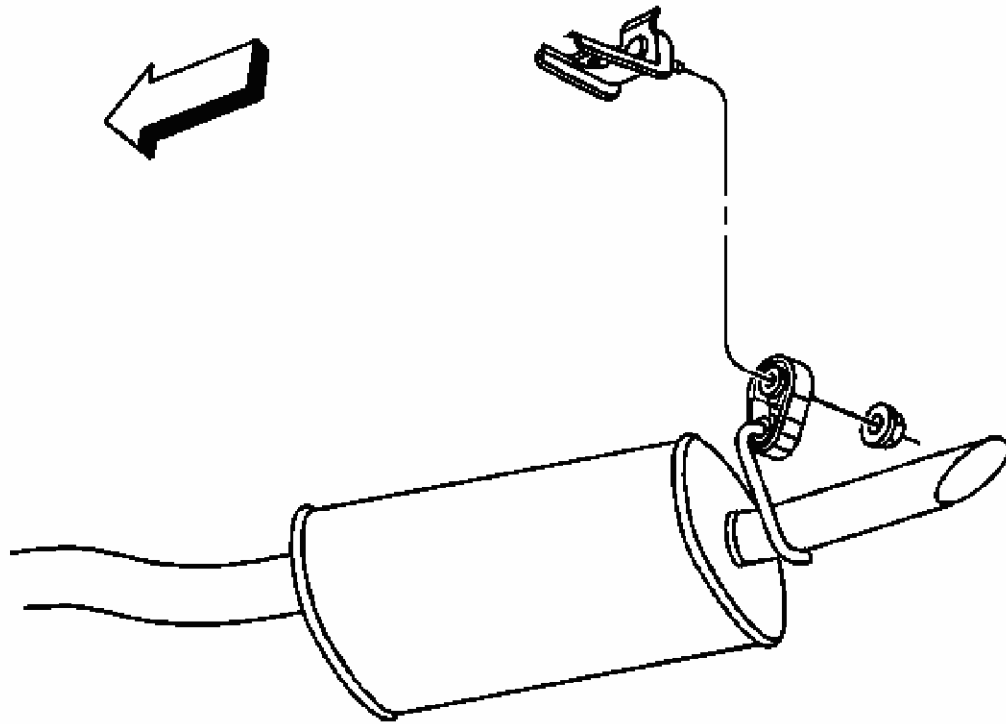


Fig. 85: Removing/Installing Rear Exhaust Hanger (Single Muffler System)
Courtesy of GENERAL MOTORS CORP.

1. Install the rear exhaust hanger bracket to the rear exhaust hanger.

NOTE: Refer to Fastener Notice .

2. Install the rear exhaust hanger to exhaust hanger bracket nut.

Tighten: Tighten the nut to 30 N.m (22 lb ft).

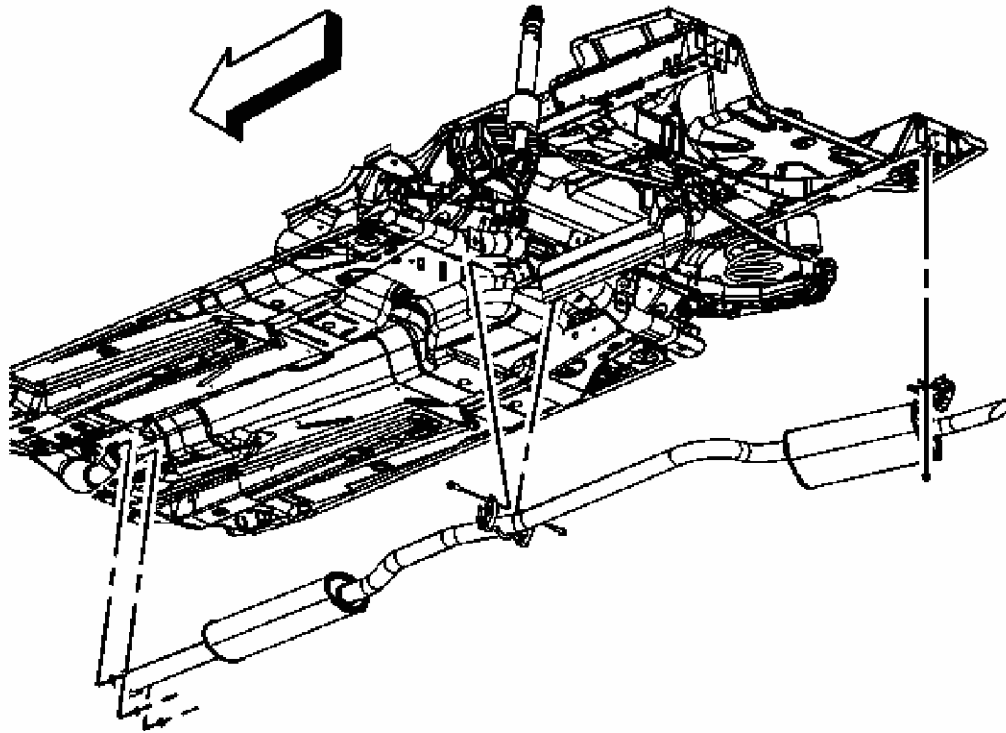


Fig. 86: Identifying Exhaust System Mounting Points
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to EXHAUST SYSTEM INSPECTION NOTICE .

3. Install a NEW catalytic converter to muffler gasket over the catalytic converter studs.

NOTE: Refer to FLEX DECOUPLER NOTICE .

4. With the aid of an assistant, raise and install the exhaust system.
5. Install the muffler to catalytic converter nuts until snug.
6. Install the rear exhaust hanger bracket to rear compartment rail bolt.

Tighten: Tighten the bolt to 50 N.m (37 lb ft).

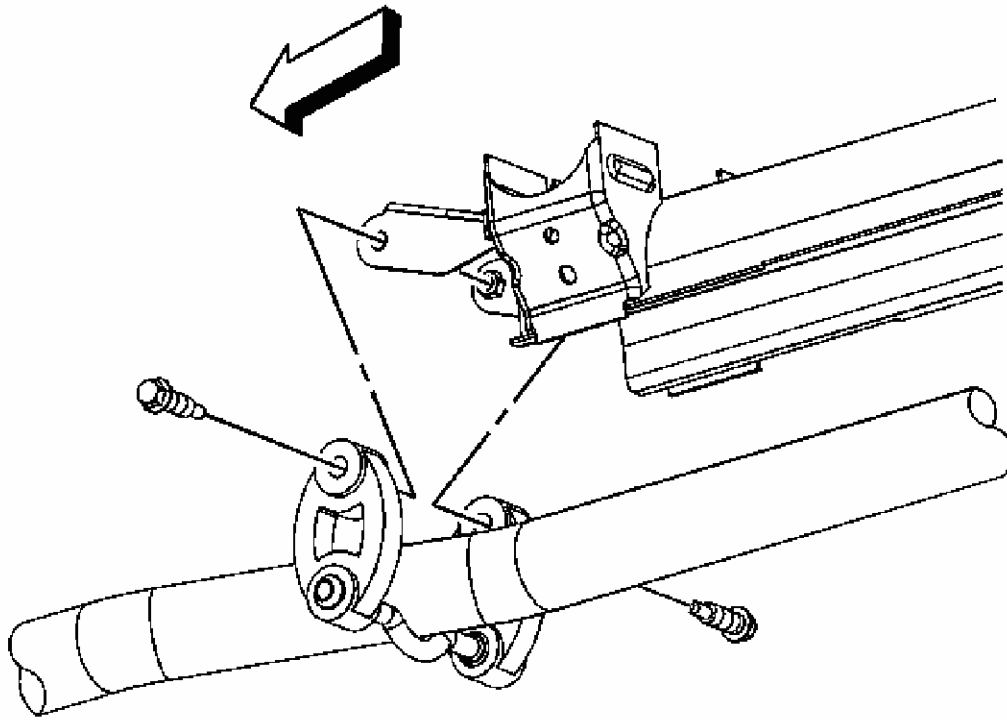


Fig. 87: View Of Center Exhaust Hanger Bolts
Courtesy of GENERAL MOTORS CORP.

7. Install the center exhaust hangers to rear suspension support bracket bolts.

Tighten: Tighten the bolts to 30 N.m (22 lb ft).

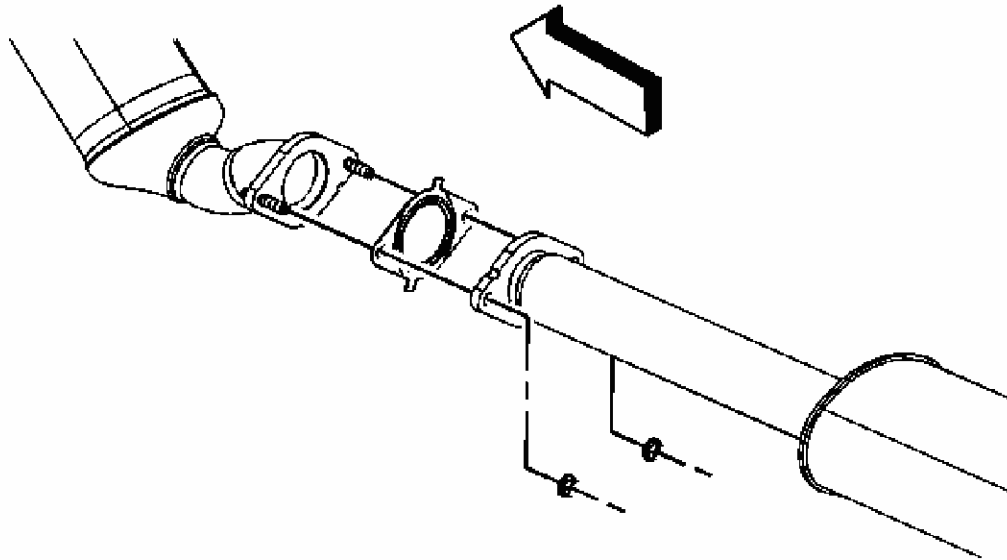


Fig. 88: Disconnecting/Reconnecting Muffler To Catalytic Converter Nuts
Courtesy of GENERAL MOTORS CORP.

8. Tighten the muffler to catalytic converter nuts previously installed in step 5.

Tighten: Tighten the nuts to 25 N.m (18 lb ft).

9. Lower the vehicle.

EXHAUST SYSTEM REPLACEMENT (RPO LD8)

Removal Procedure

CAUTION: Refer to EXHAUST SERVICE CAUTION .

CAUTION: Refer to PROTECTIVE GOGGLES AND GLOVE CAUTION .

IMPORTANT: Servicing of the mufflers, resonator or pipe requires the replacement of the exhaust system as a complete assembly.

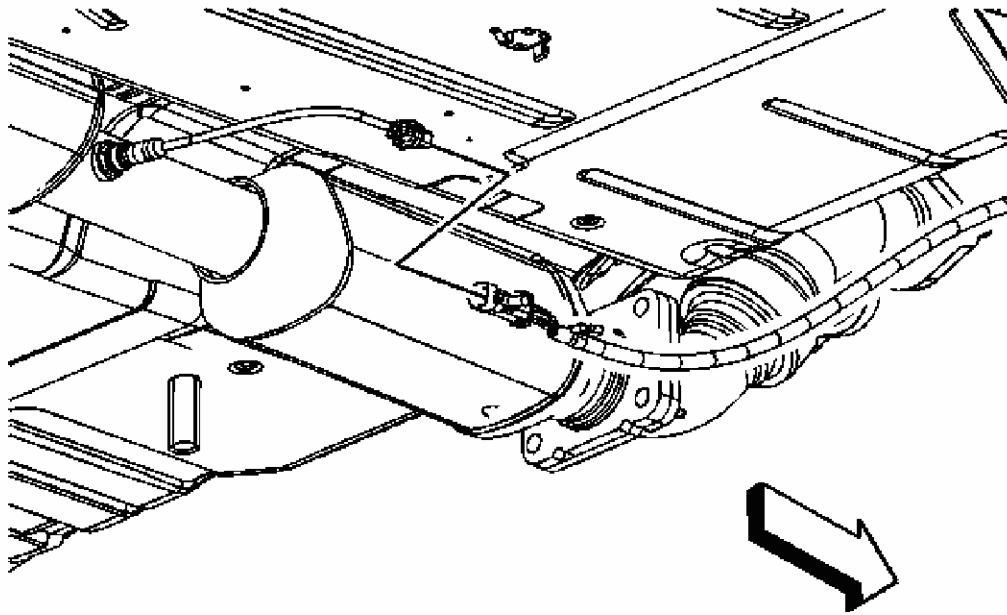


Fig. 89: Identifying Oxygen Sensor Wiring Harness Heat Shield
Courtesy of GENERAL MOTORS CORP.

1. Remove the oxygen sensor wiring harness heat shield. Refer to **Oxygen Sensor Wiring Harness Heat Shield Replacement**.
2. Remove the connector position assurance (CPA) retainer.
3. Disconnect the heated oxygen sensor (HO2S) electrical connector.

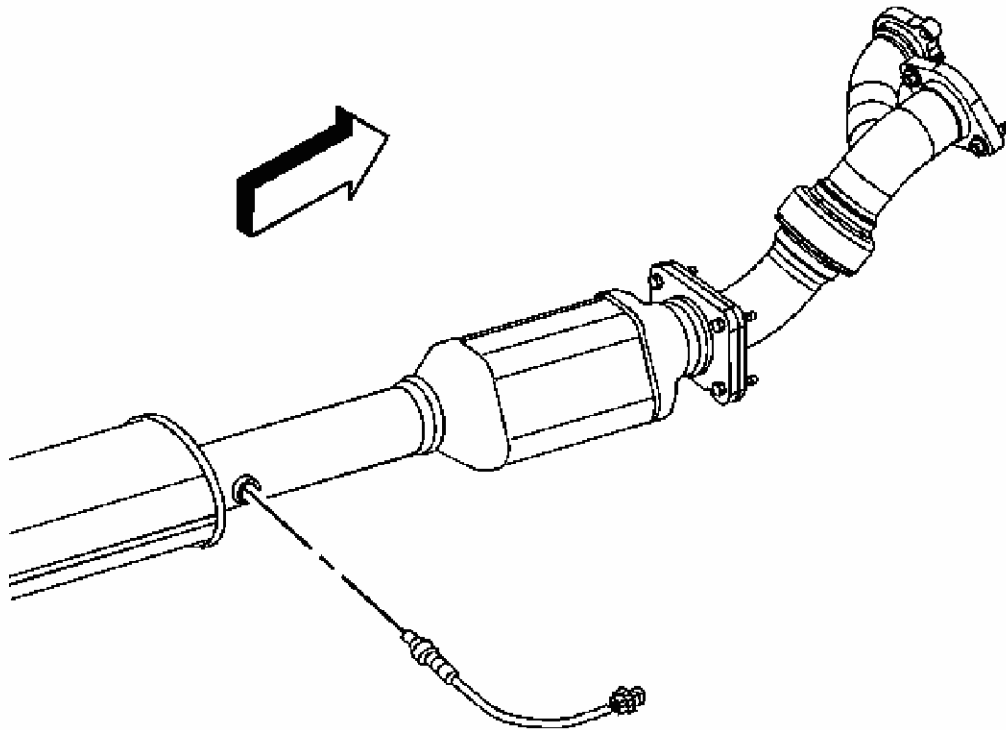


Fig. 90: Identifying HO2S

Courtesy of GENERAL MOTORS CORP.

4. Remove the HO2S.

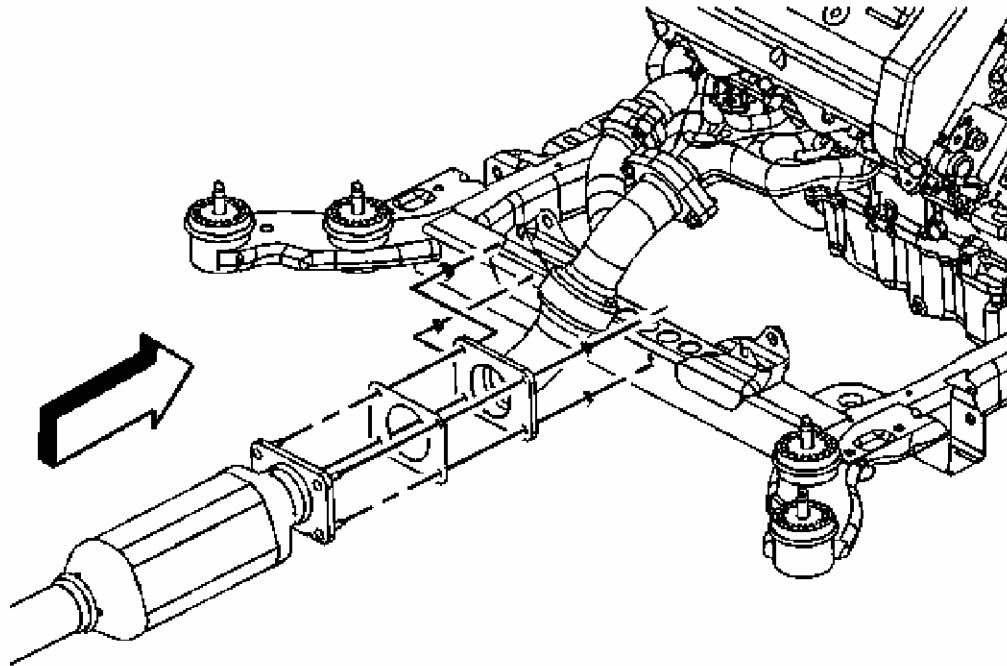


Fig. 91: View Of Muffler To Exhaust Manifold Pipe Nuts
Courtesy of GENERAL MOTORS CORP.

5. Remove the muffler to exhaust manifold pipe nuts.
6. Suitably support the exhaust system.

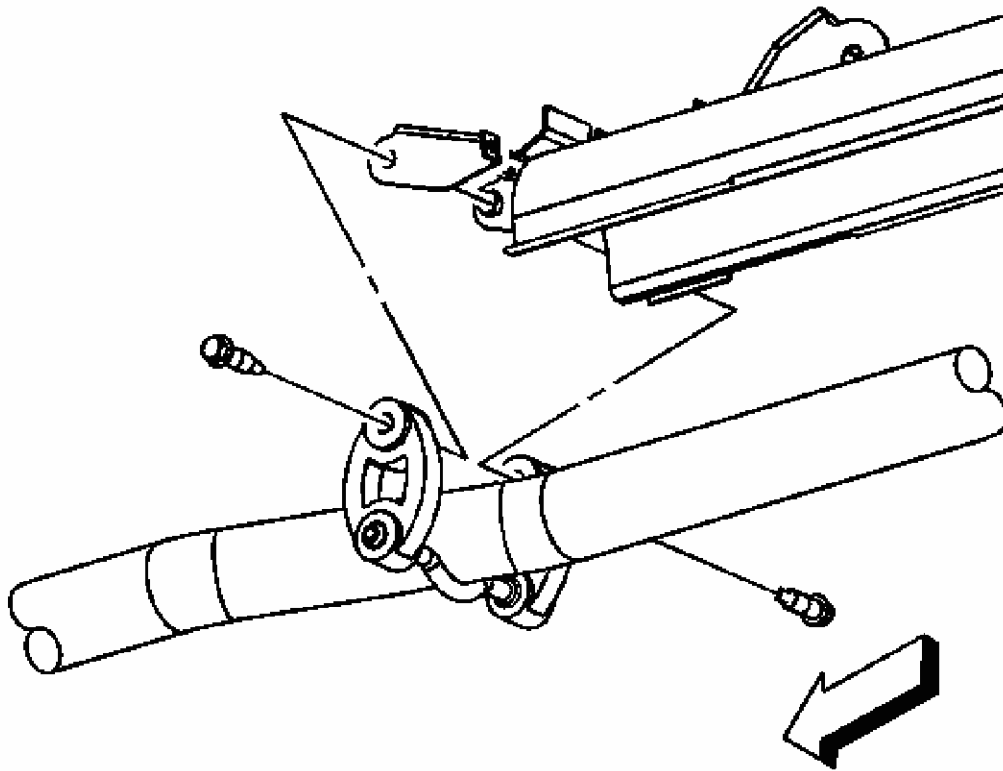


Fig. 92: View Of Exhaust Hanger Bracket Bolts
Courtesy of GENERAL MOTORS CORP.

7. Remove the exhaust hanger to the rear suspension support bracket bolts.

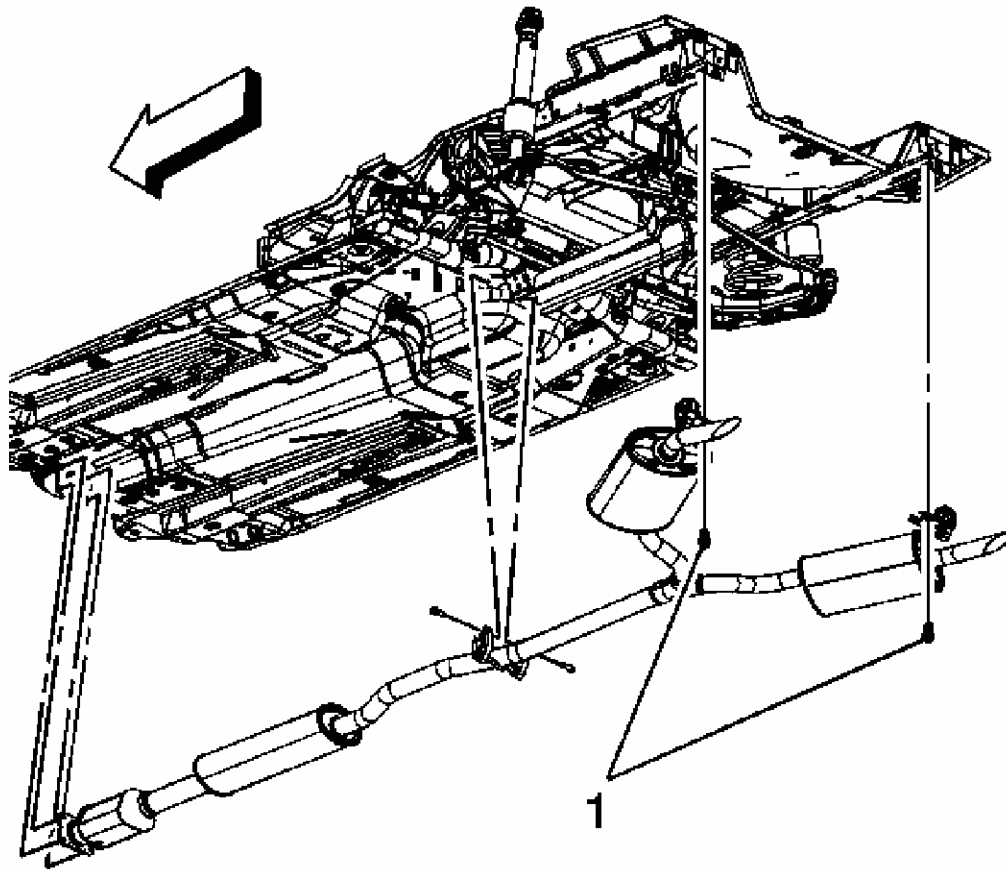


Fig. 93: Identifying Exhaust System Mounting Points
Courtesy of GENERAL MOTORS CORP.

8. Remove the rear exhaust hanger bracket to the rear compartment side rail bolts (1).
9. With the aid of an assistant, lower and remove the exhaust system.
10. Remove and discard the muffler to exhaust manifold pipe gasket.

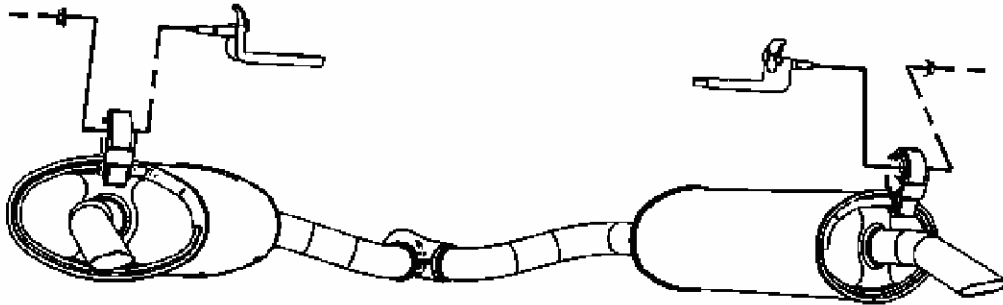


Fig. 94: Identifying Rear Exhaust System Hanger Bracket Nuts
Courtesy of GENERAL MOTORS CORP.

11. Remove the rear exhaust hanger to hanger bracket nuts.
12. Remove the rear exhaust hanger brackets.

Installation Procedure

NOTE: Refer to EXHAUST SYSTEM INSPECTION NOTICE .

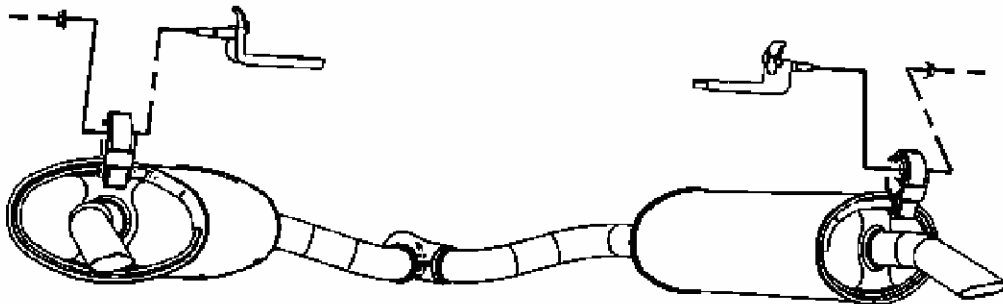


Fig. 95: Identifying Rear Exhaust System Hanger Bracket Nuts
Courtesy of GENERAL MOTORS CORP.

1. Install the rear exhaust hanger brackets.

NOTE: Refer to Fastener Notice .

2. Install the rear exhaust hanger to hanger bracket nuts.

Tighten: Tighten the nuts to 30 N.m (22 lb ft).

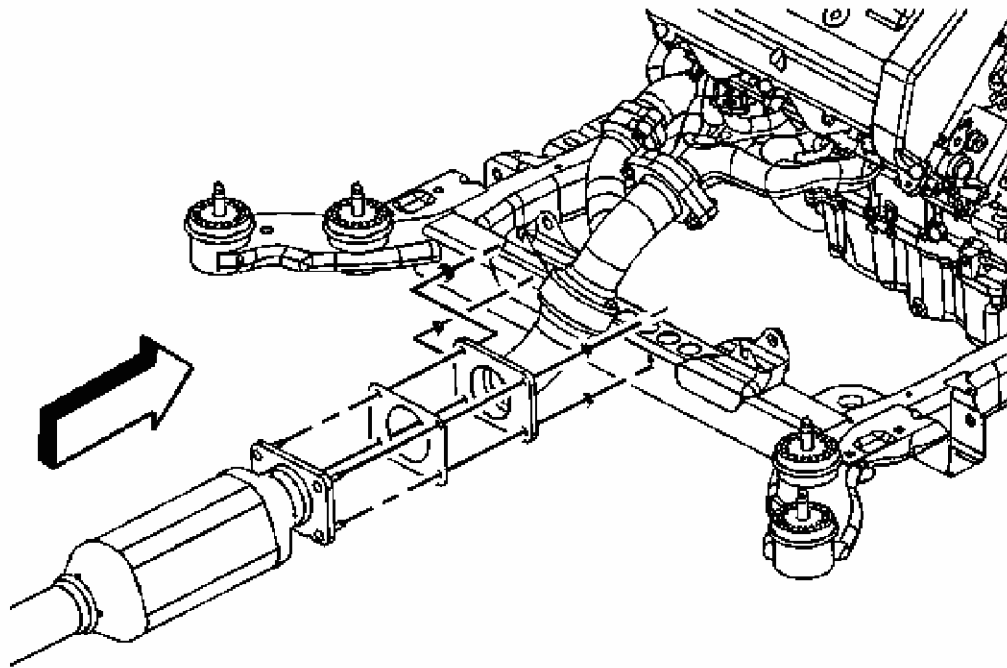


Fig. 96: View Of Muffler To Exhaust Manifold Pipe Nuts
Courtesy of GENERAL MOTORS CORP.

3. Install a NEW muffler to exhaust manifold pipe gasket onto the studs.
4. With the aid of an assistant, raise the exhaust system.
5. Install the muffler to rear exhaust manifold pipe.
6. Install and snug the muffler to rear exhaust manifold pipe nuts.

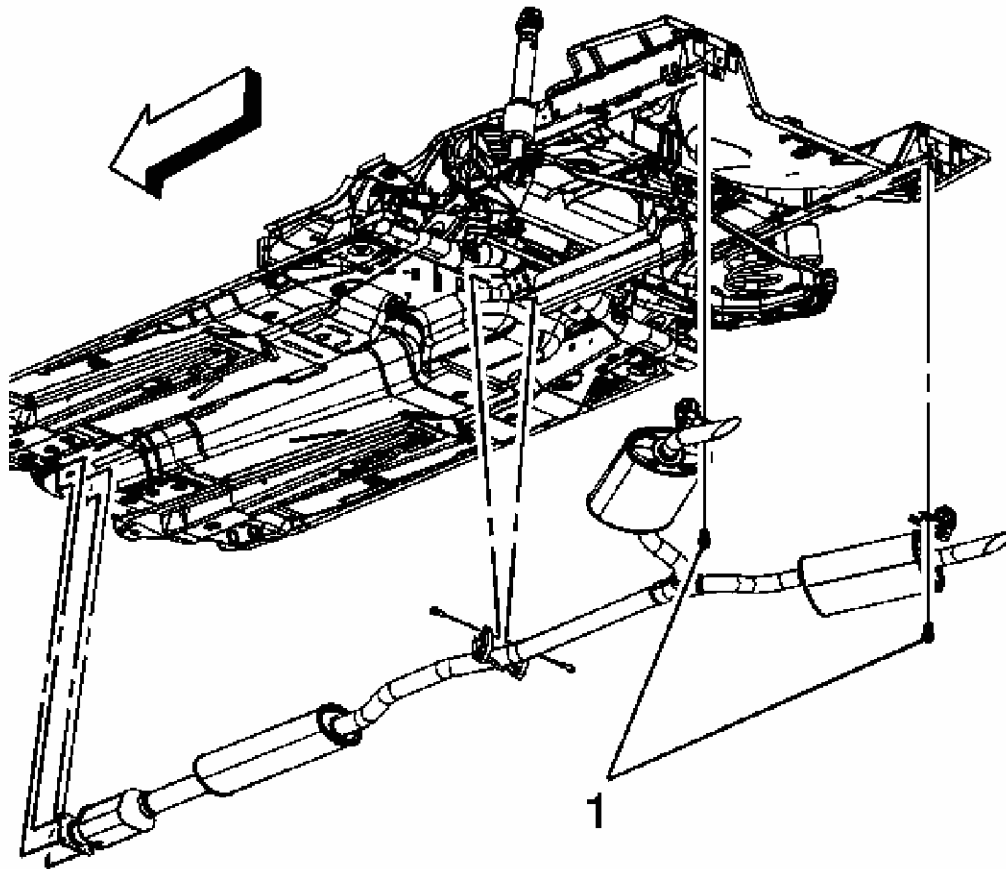


Fig. 97: Identifying Exhaust System Mounting Points
Courtesy of GENERAL MOTORS CORP.

7. Install the rear exhaust hanger bracket to the rear compartment side rail bolts (1).

Tighten: Tighten the bolts to 50 N.m (37 lb ft).

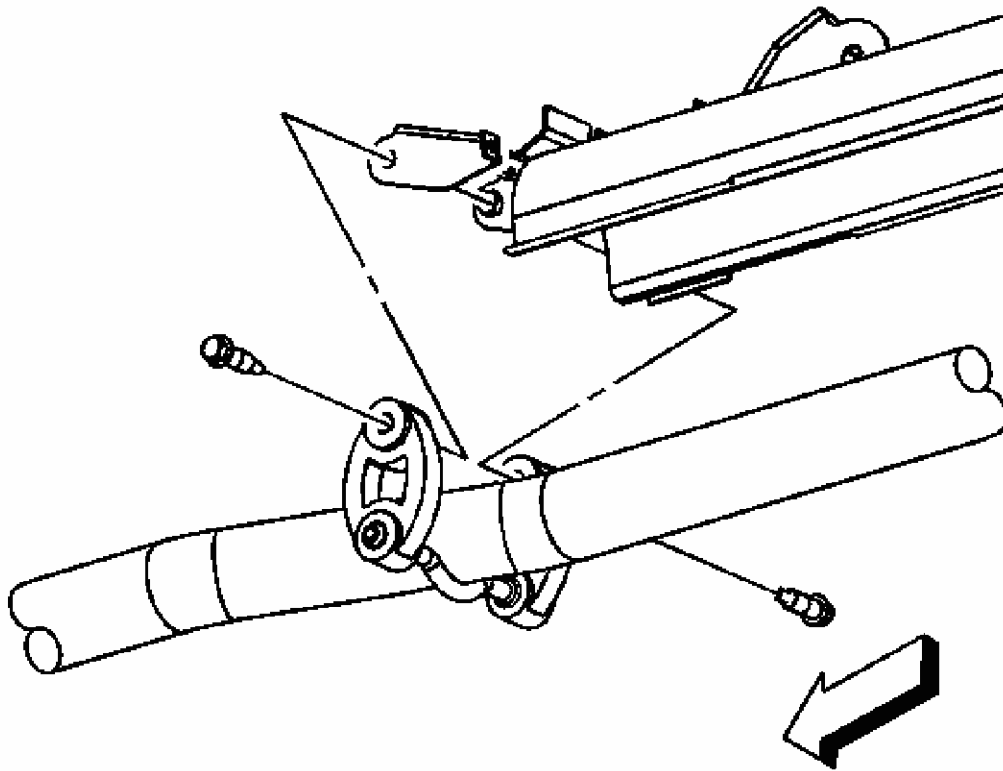


Fig. 98: View Of Exhaust Hanger Bracket Bolts
Courtesy of GENERAL MOTORS CORP.

8. Install the exhaust hanger to the rear suspension support bracket bolts.

Tighten: Tighten the bolts to 30 N.m (22 lb ft).

9. Tighten the muffler to rear exhaust manifold pipe nuts previously installed.

Tighten: Tighten the nuts to 25 N.m (18 lb ft).

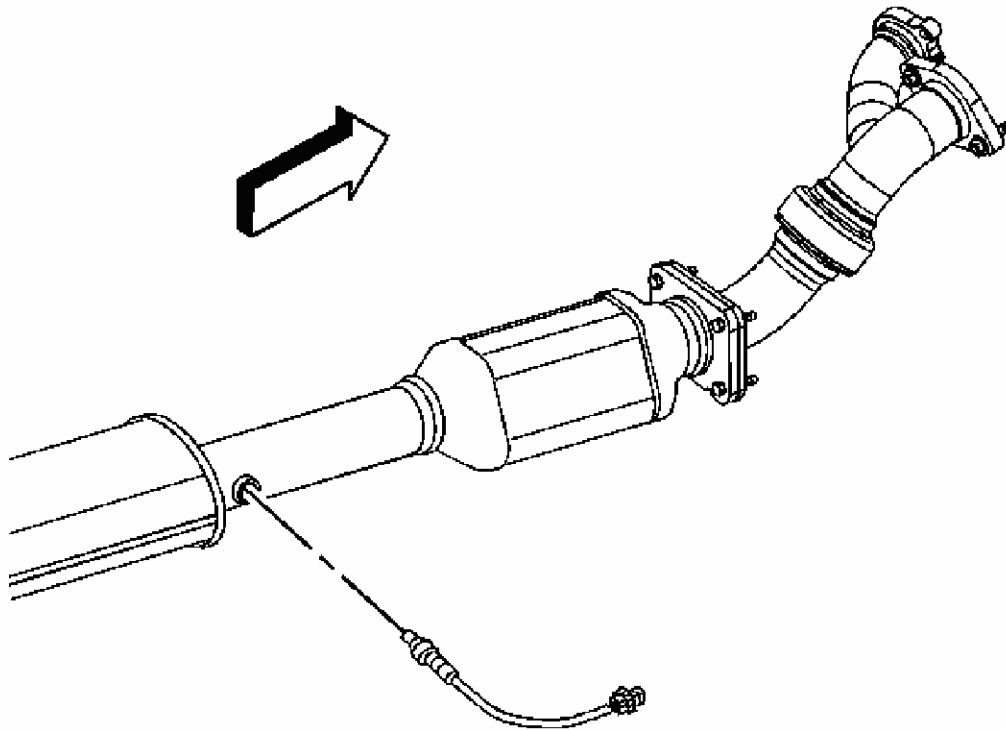


Fig. 99: Identifying HO2S

Courtesy of GENERAL MOTORS CORP.

10. If reusing the old HO2S, coat the threads with anti-sieze compound, GM P/N 12377953 or equivalent.
11. Install the HO2S.

Tighten: Tighten the sensor to 41 N.m (30 lb ft).

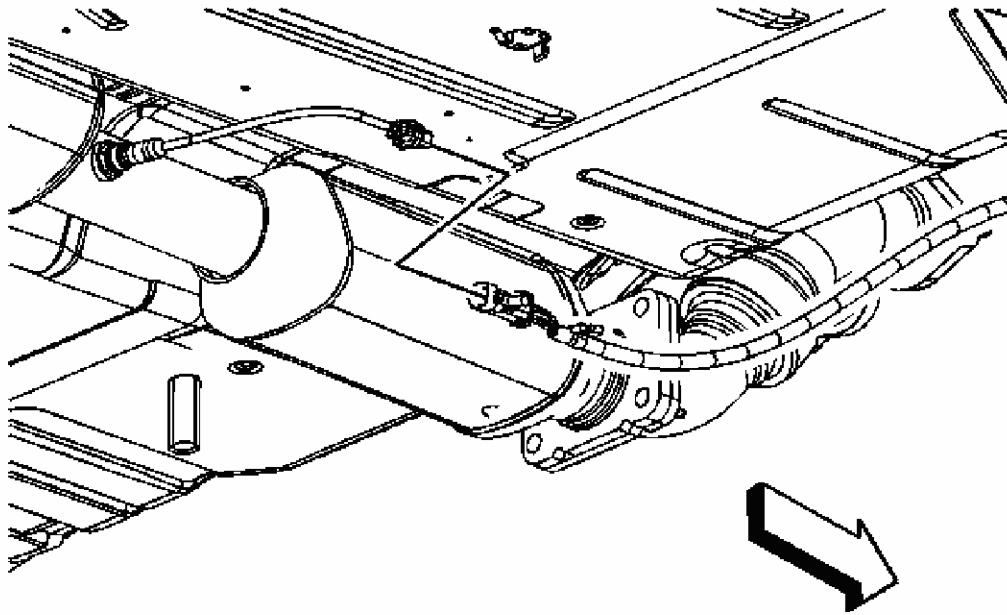


Fig. 100: Identifying Oxygen Sensor Wiring Harness Heat Shield
Courtesy of GENERAL MOTORS CORP.

12. Connect the HO2S electrical connector.
13. Install the CPA retainer.
14. Install the oxygen sensor wiring harness heat shield. Refer to **Oxygen Sensor Wiring Harness Heat Shield Replacement**.

CATALYTIC CONVERTER REPLACEMENT

Removal Procedure

CAUTION: Refer to **EXHAUST SERVICE CAUTION** .

CAUTION: Refer to **PROTECTIVE GOGGLES AND GLOVE CAUTION** .

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Support the exhaust system near the resonator with a suitable jack.
3. Remove the oxygen sensor. It is not necessary to disconnect the electrical connector.

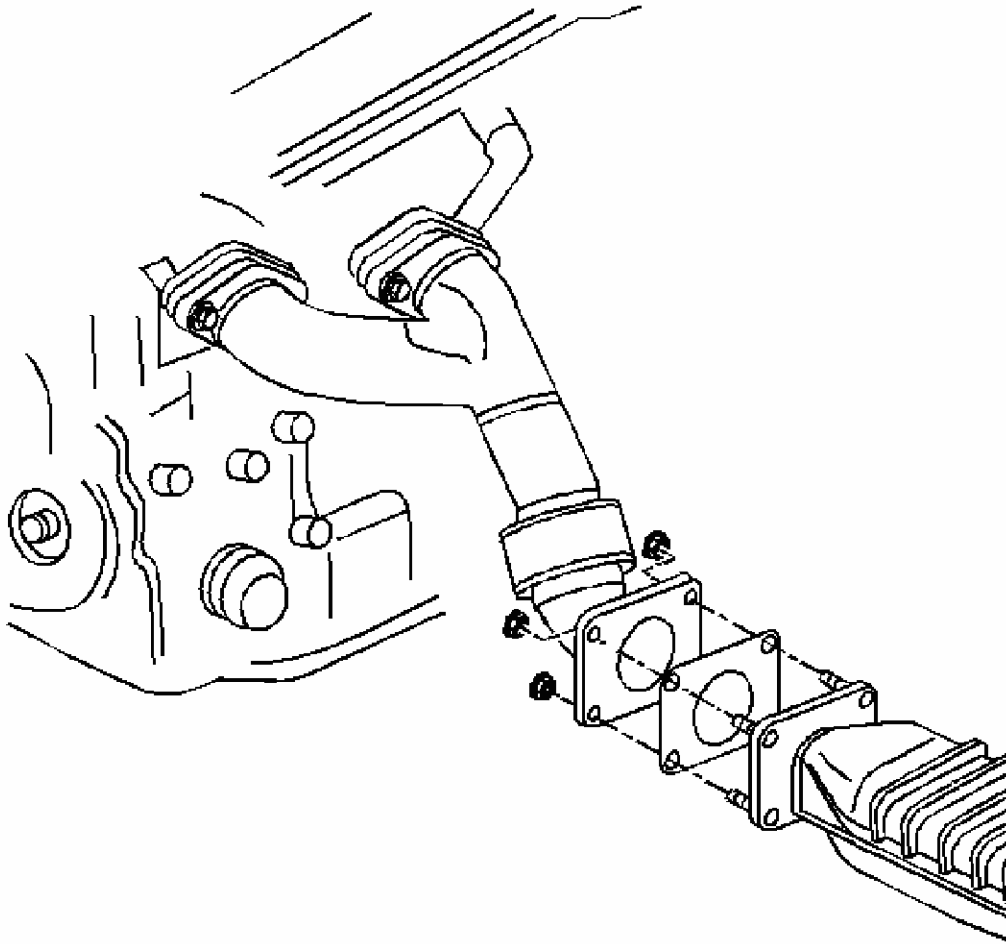


Fig. 101: View Of Exhaust Pipe & Catalytic Converter
Courtesy of GENERAL MOTORS CORP.

4. Remove the nuts securing the catalytic converter to the exhaust manifold pipe.

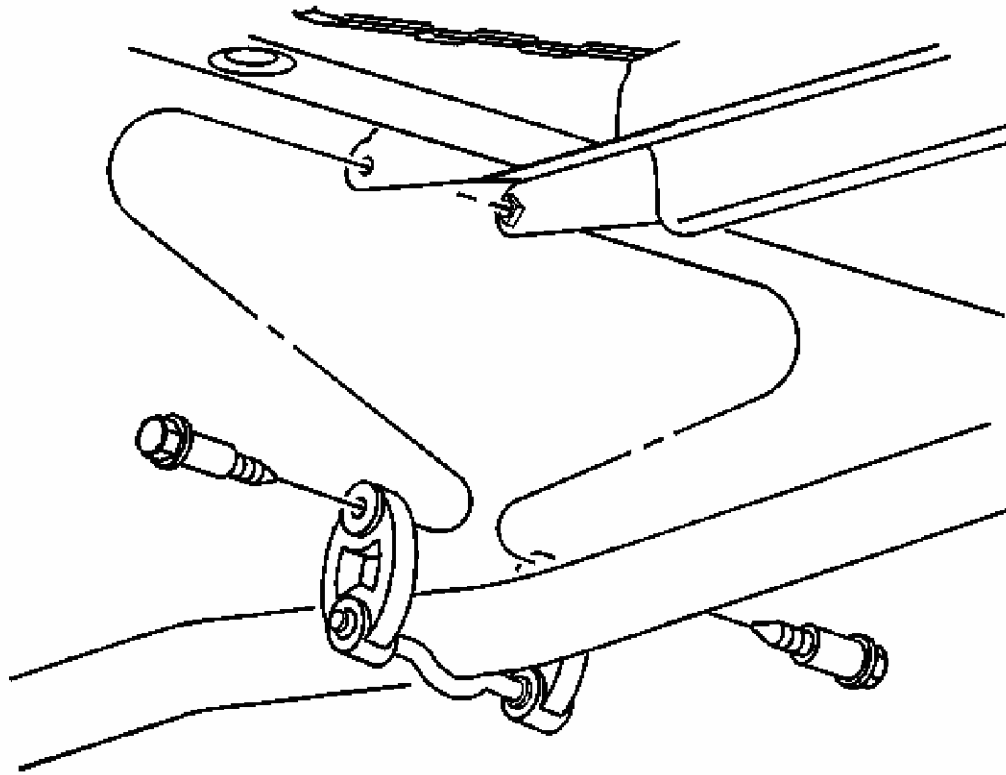


Fig. 102: View Of Center Exhaust Hangers & Bolts
Courtesy of GENERAL MOTORS CORP.

5. Remove the bolts securing the center exhaust hangers to the rear suspension support brackets.
6. Remove the catalytic converter from the manifold pipe.
7. Lower the exhaust system.

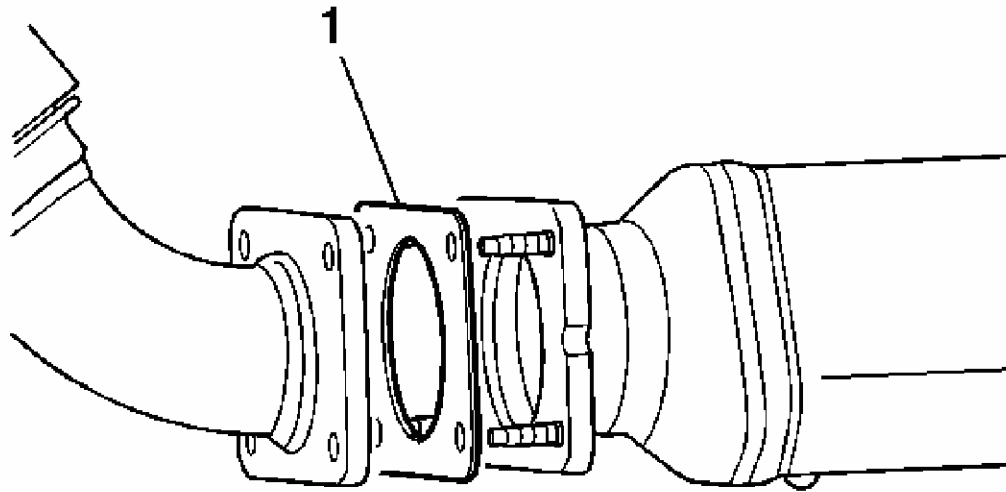


Fig. 103: Identifying Catalytic Converter Gasket
Courtesy of GENERAL MOTORS CORP.

8. Remove the catalytic converter gasket (1). Do not reuse the gasket.

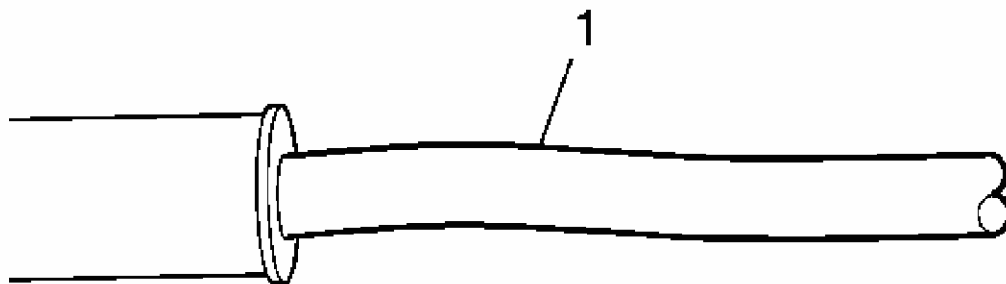


Fig. 104: Identifying Pipe Cut Location
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Ensure the cut (1) is made 34 mm (1.3 in) from the weld on the intermediate pipe.

9. Cut the intermediate pipe 34 mm (1.3 in) from the resonator weld.

Installation Procedure

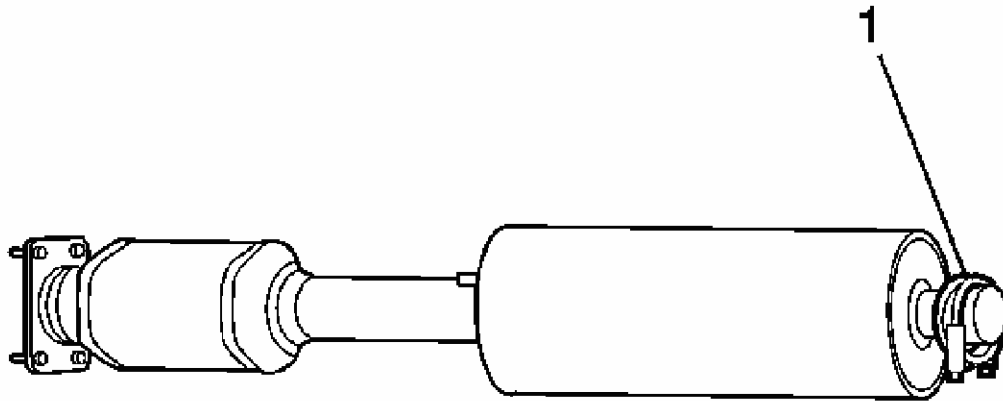


Fig. 105: Identifying Catalytic Converter Assembly Outlet Pipe Clamp
Courtesy of GENERAL MOTORS CORP.

1. Slide 2 service clamps (1) over the catalytic converter assembly outlet pipe.
Do not tighten at this time.

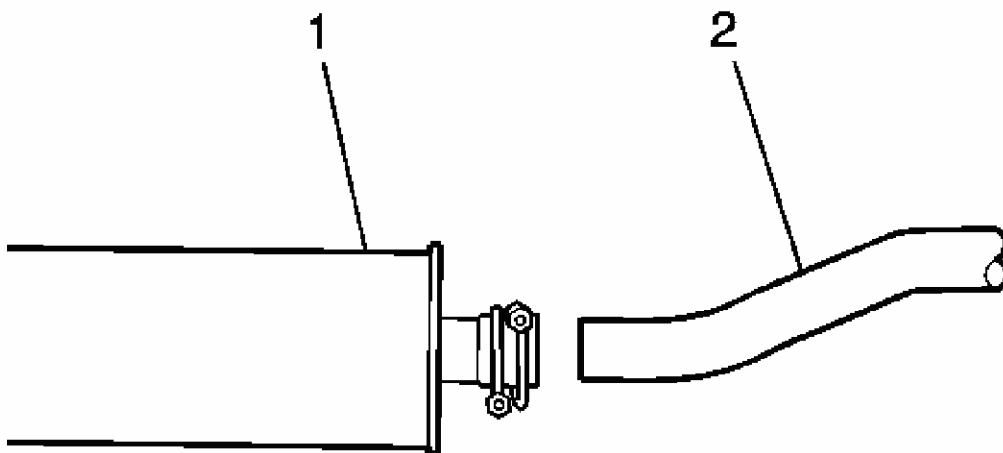


Fig. 106: Identifying Catalytic Converter Assembly & Intermediate Pipe
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Ensure the O2 sensor boss is facing the right side of the vehicle.

2. Slide the catalytic converter assembly (1) outlet pipe over the intermediate pipe (2).

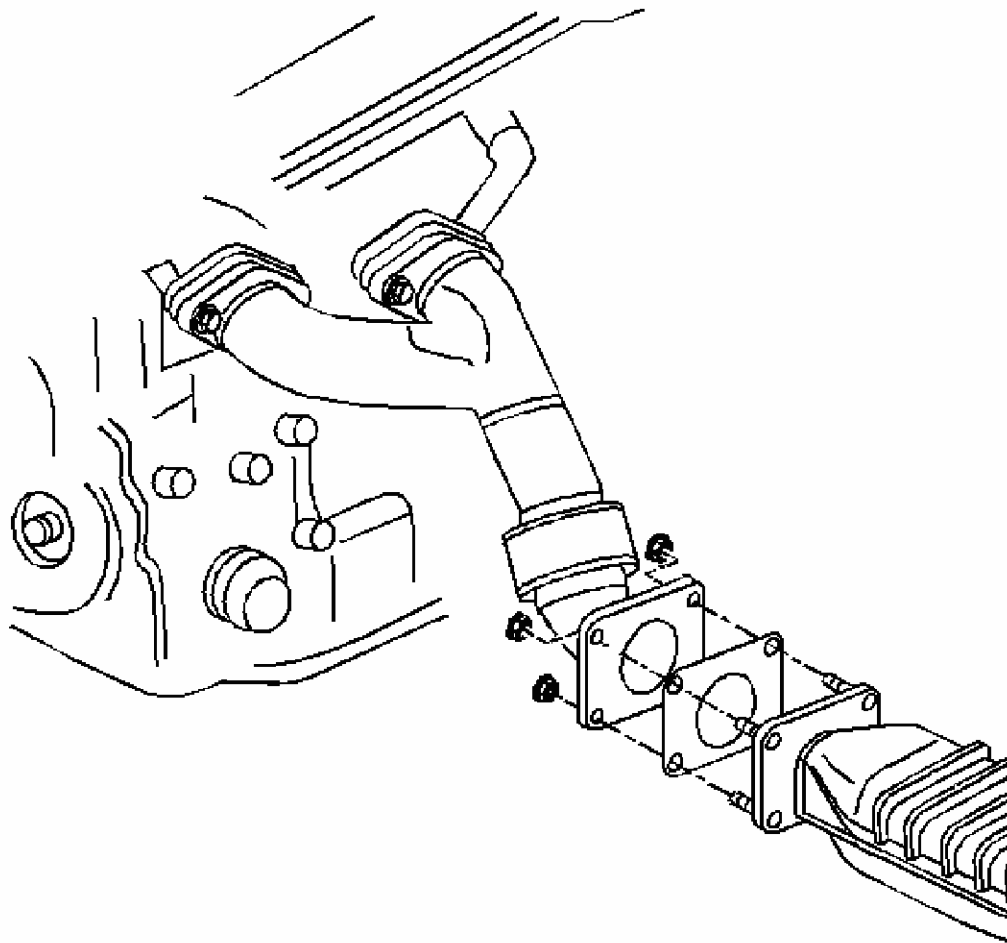


Fig. 107: View Of Exhaust Pipe & Catalytic Converter
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to EXHAUST SYSTEM INSPECTION NOTICE .

3. Place a NEW catalytic converter gasket over the catalytic converter studs.

NOTE: Refer to FLEX DECOUPLER NOTICE .

4. Raise the exhaust system into position, aligning the catalytic converter with the exhaust manifold pipe.
5. Install the nuts securing the catalytic converter to the exhaust manifold pipe.

Do not tighten at this time.

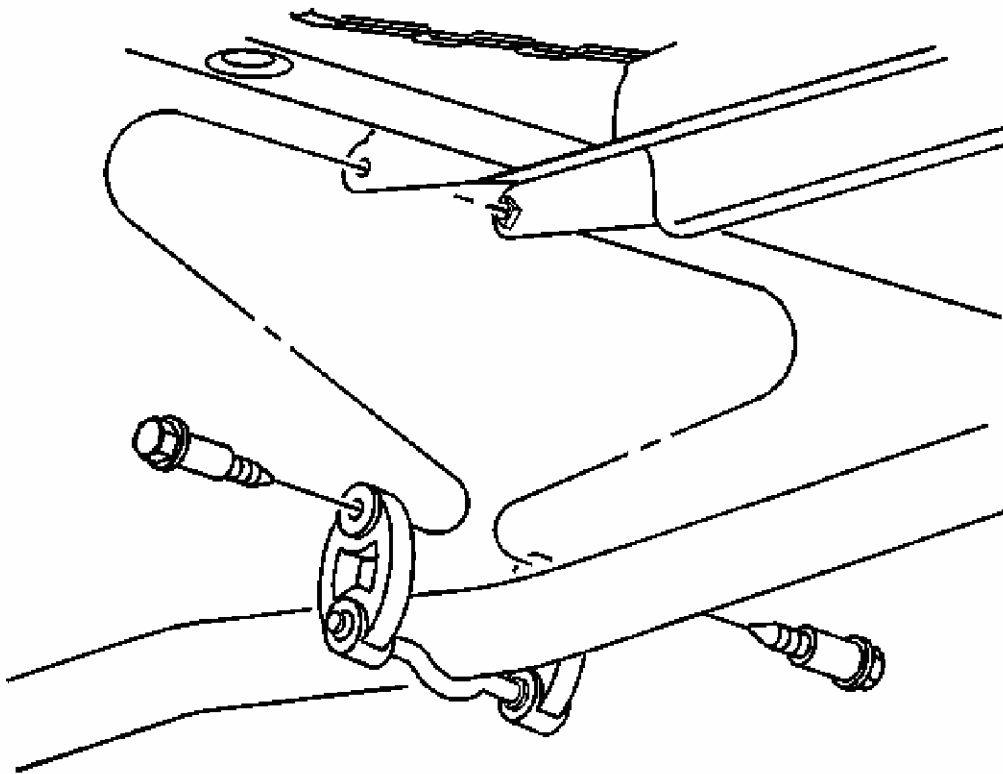


Fig. 108: View Of Center Exhaust Hangers & Bolts
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice .

6. Install the bolts securing the center exhaust hangers to the rear suspension support brackets.

Tighten: Tighten the center exhaust hanger bolts to 30 N.m (22 lb ft).

7. Tighten the catalytic converter nuts.

Tighten: Tighten the catalytic converter nuts in a crisscross pattern to 25 N.m (18 lb ft).

8. Remove the jack from under the vehicle.

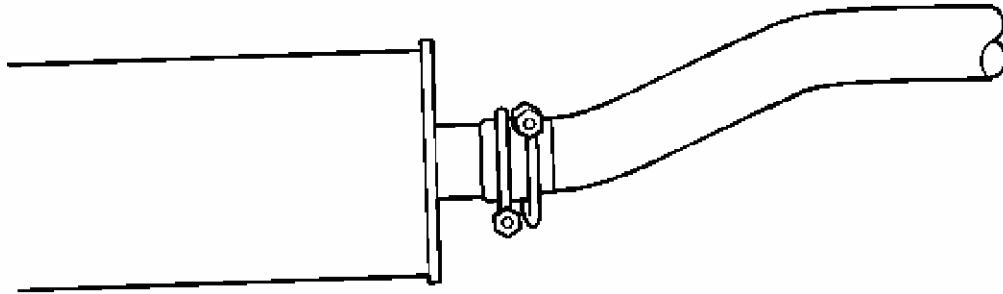


Fig. 109: View Of Catalytic Converter Assembly Outlet Pipe Clamp
Courtesy of GENERAL MOTORS CORP.

9. Position the service clamps midway on the catalytic converter assembly outlet pipe, as close together as possible.
10. Rotate the clamps so the fastening ends are pointing in opposite directions.

Tighten: Tighten the service clamps to 54 N.m (40 lb ft).

11. Lower the vehicle.
12. Check the exhaust system for leaks.

EXHAUST SYSTEM INSULATOR, HANGER, BRACKET REPLACEMENT

Removal Procedure

CAUTION: Refer to EXHAUST SERVICE CAUTION .

CAUTION: Refer to PROTECTIVE GOGGLES AND GLOVE CAUTION .

IMPORTANT: Service the exhaust system hangers individually in order to retain the support for the exhaust system.

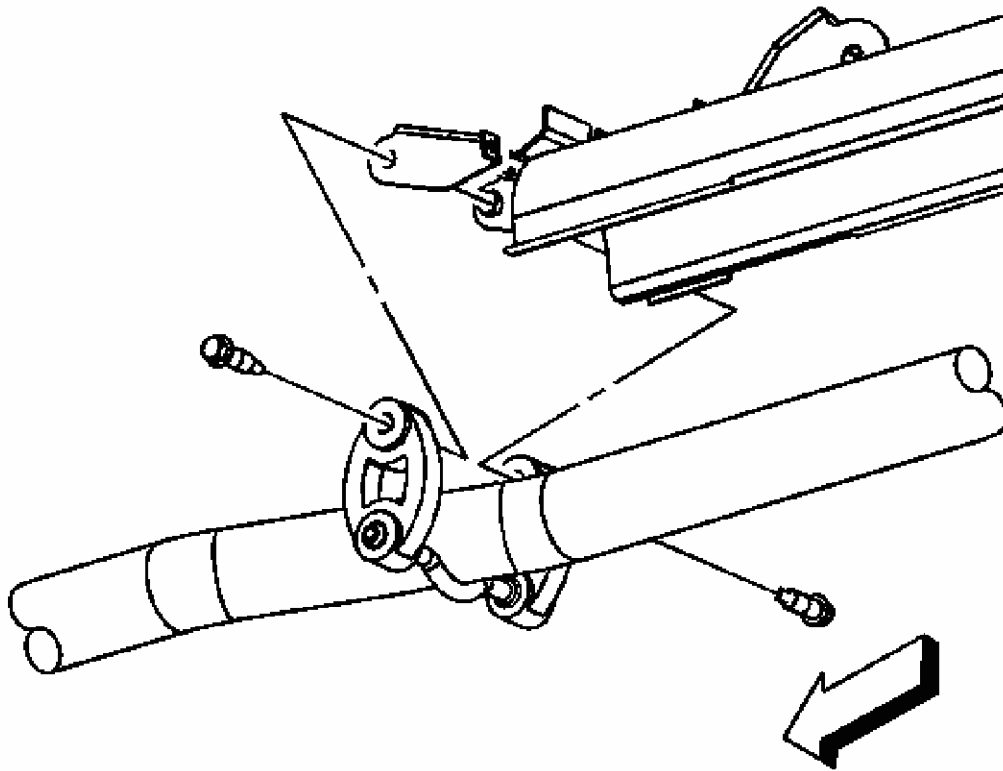


Fig. 110: View Of Exhaust Hanger Bracket Bolts
Courtesy of GENERAL MOTORS CORP.

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the exhaust hanger to the rear suspension support bracket bolt.

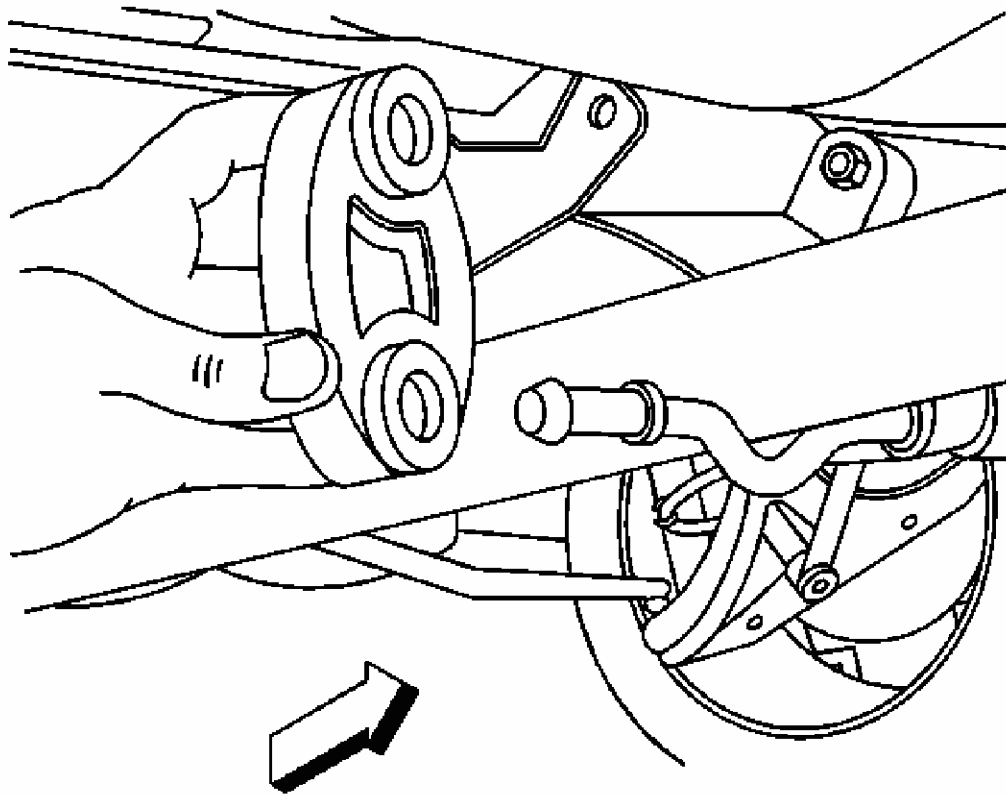


Fig. 111: Removing/Installing Exhaust Hanger
Courtesy of GENERAL MOTORS CORP.

3. Apply a suitable lubricant to the exhaust hanger rod in order to ease the removal of the hanger.
4. Pull outward on the exhaust hanger in order to remove it from the exhaust pipe hanger rod.

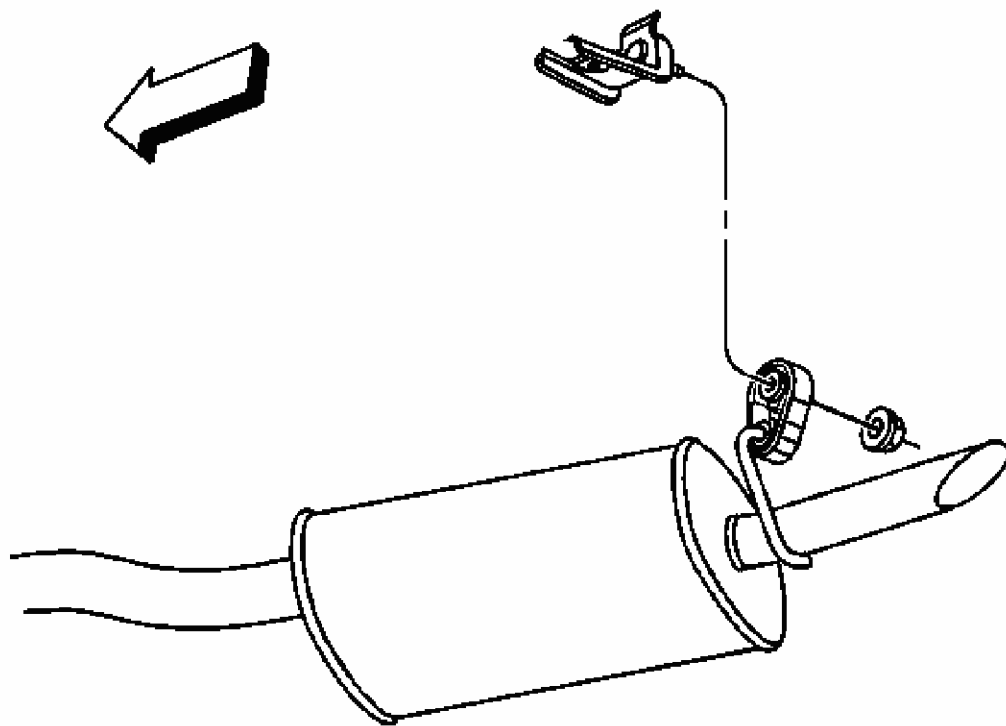


Fig. 112: Removing/Installing Rear Exhaust Hanger (Single Muffler System)
Courtesy of GENERAL MOTORS CORP.

5. Remove the rear exhaust hanger to hanger bracket nut. (single exhaust shown, dual exhaust similar).
6. Apply a suitable lubricant to the rear hanger rod in order to ease the removal of the hanger.
7. Pull outward on the rear exhaust hanger in order to remove it from the tail pipe hanger rod.

Installation Procedure

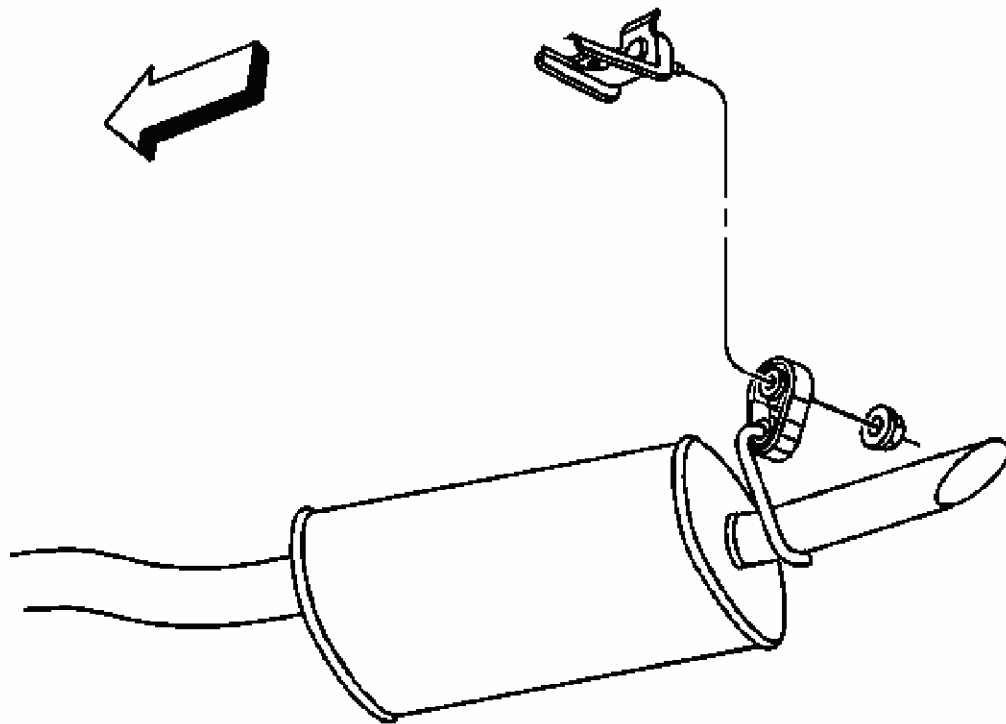


Fig. 113: Removing/Installing Rear Exhaust Hanger (Single Muffler System)
Courtesy of GENERAL MOTORS CORP.

1. Apply a soapy solution to the rear hanger rod and the inner diameter of the rear exhaust hanger in order to ease the installation of the hanger.
2. Press the rear exhaust hanger over the tail pipe hanger rod.
3. Position the rear exhaust hanger to the rear exhaust hanger bracket. (single exhaust shown, dual exhaust similar).

NOTE: Refer to Fastener Notice .

4. Install the rear exhaust hanger to hanger bracket nut.

Tighten: Tighten the nut to 30 N.m (22 lb ft).

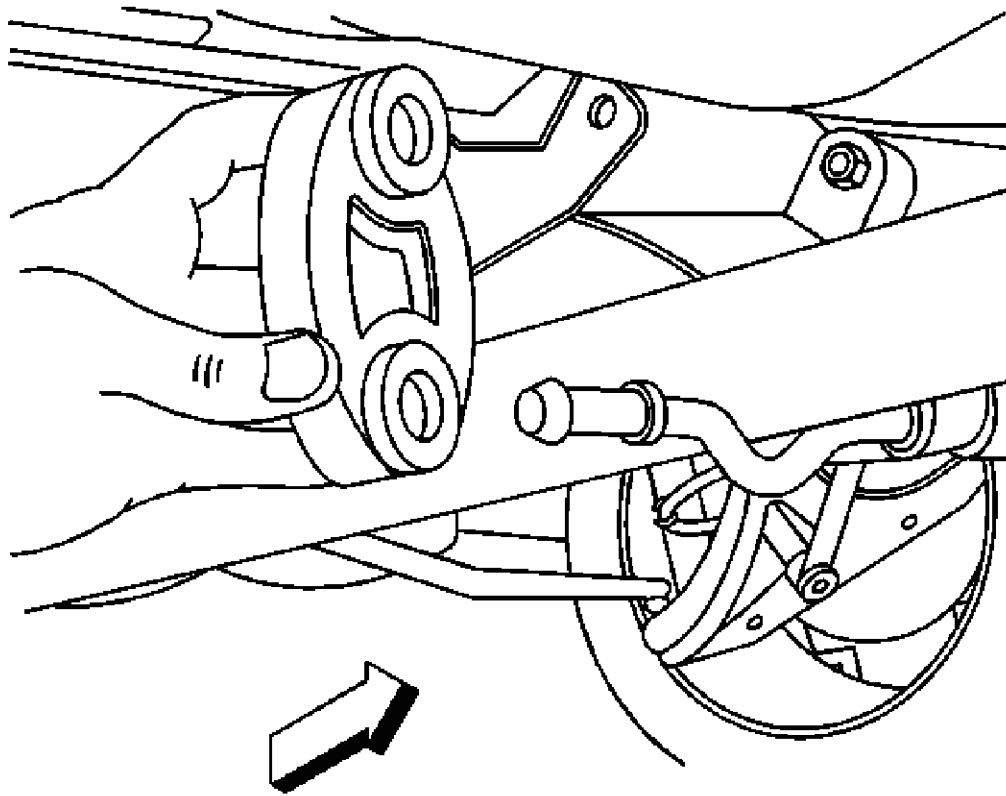


Fig. 114: Removing/Installing Exhaust Hanger
Courtesy of GENERAL MOTORS CORP.

5. Apply a soapy solution to the exhaust pipe hanger rod and the inner diameter of the center exhaust hanger in order to ease the installation of the hanger.
6. Press the exhaust hanger over the exhaust pipe hanger rod.

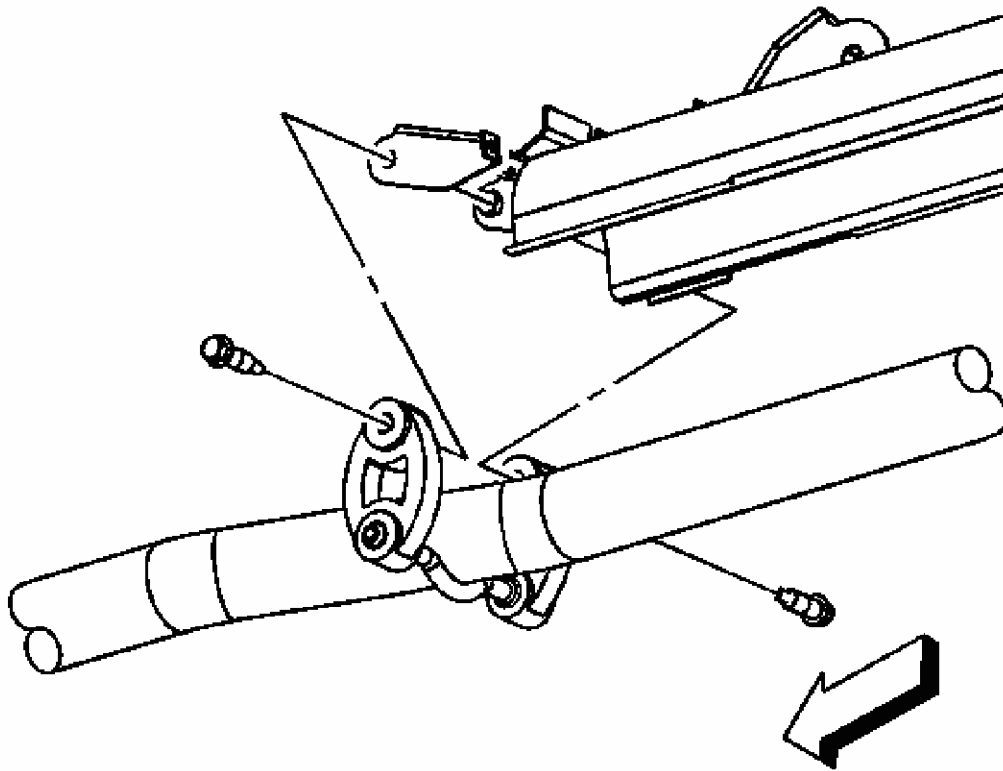


Fig. 115: View Of Exhaust Hanger Bracket Bolts
Courtesy of GENERAL MOTORS CORP.

7. Install the exhaust hanger to the rear suspension support bracket bolt.

Tighten: Tighten the bolt to 30 N.m (22 lb ft).

8. Lower the vehicle.

OXYGEN SENSOR WIRING HARNESS HEAT SHIELD REPLACEMENT

Removal Procedure

CAUTION: Refer to EXHAUST SERVICE CAUTION .

CAUTION: Refer to PROTECTIVE GOGGLES AND GLOVE CAUTION .

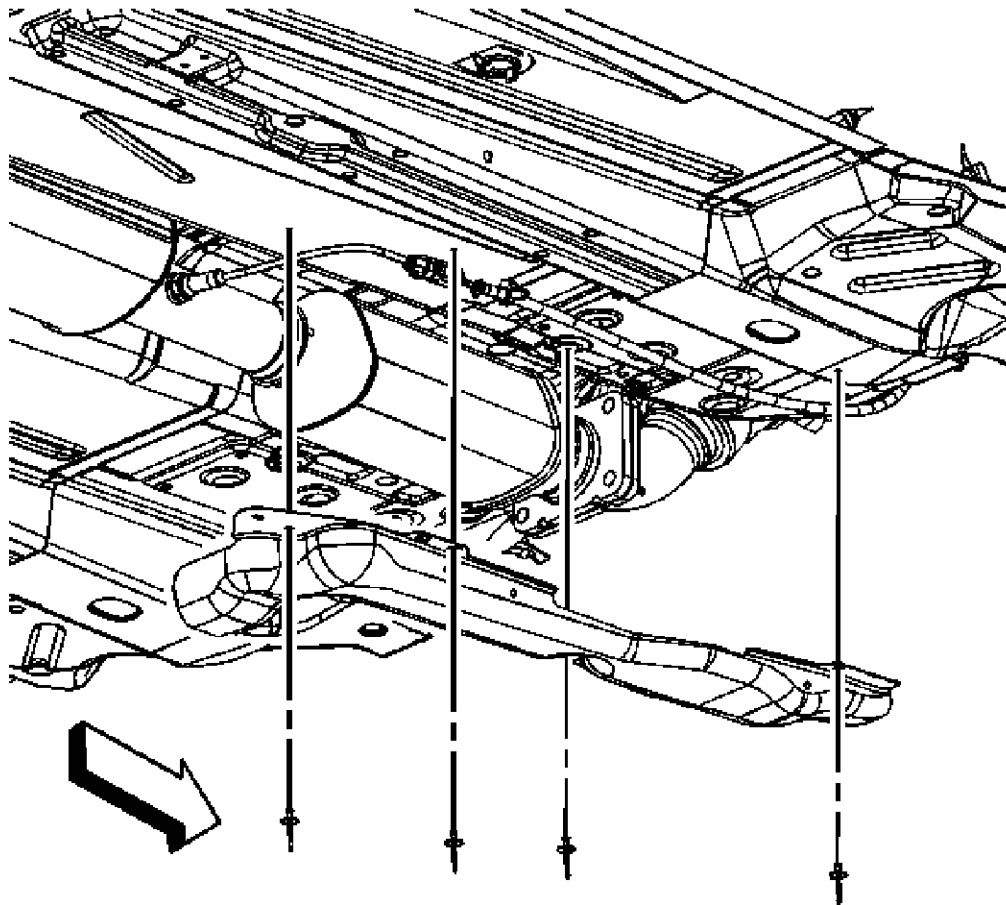


Fig. 116: View Of Oxygen Sensor Wiring Harness Heat Shield
Courtesy of GENERAL MOTORS CORP.

CAUTION: Eye protection must be worn when drilling rivets to reduce the chance of personal injury.

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Drill out the rivets.
3. Lower the heat shield until the heated oxygen sensor (HO2S) clips can be disconnected.
4. Disconnect the HO2S clips from the heat shield.
5. Remove the heat shield.

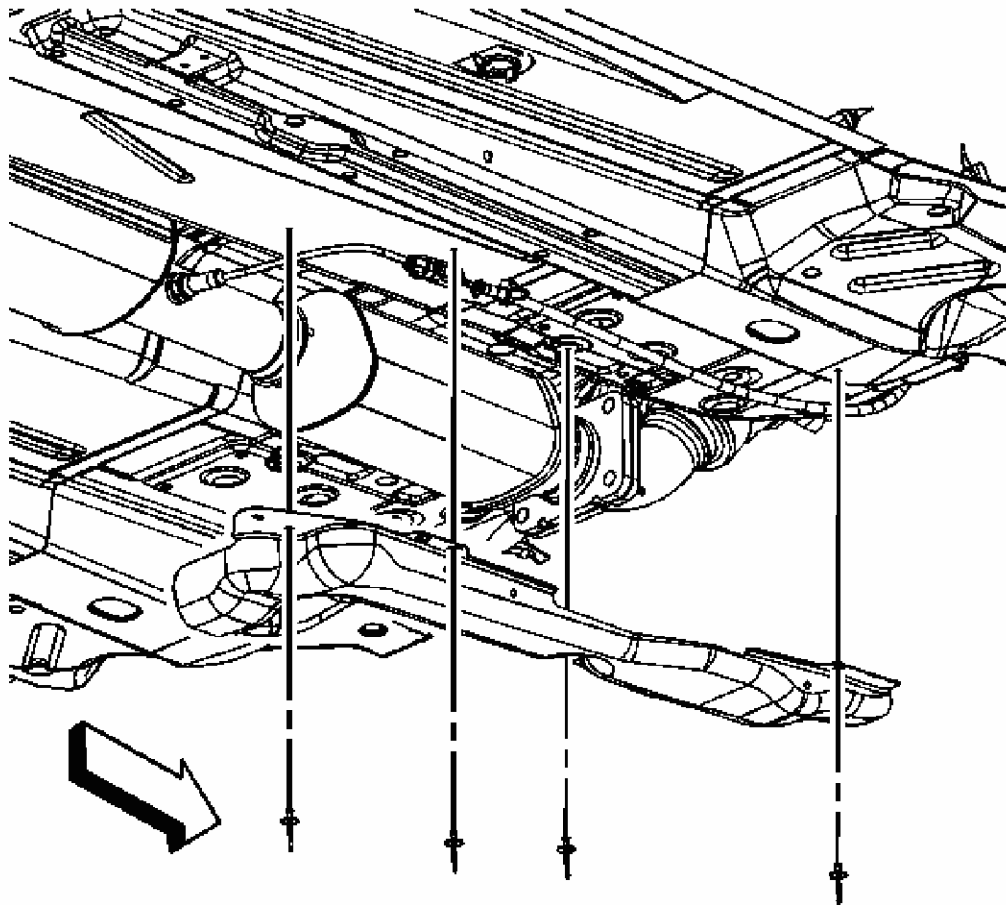


Fig. 117: View Of Oxygen Sensor Wiring Harness Heat Shield
Courtesy of GENERAL MOTORS CORP.

1. Raise the heat shield until the HO2S clips can be connected.
2. Connect the HO2S clips to the heat shield.
3. Position the heat shield to the floor panel.
4. Using a rivet gun, install the rivets.
5. Lower the vehicle.

DESCRIPTION AND OPERATION

EXHAUST SYSTEM DESCRIPTION

IMPORTANT: Use of non-OEM parts may cause driveability concerns.

The exhaust system carries exhaust gases, treated by the catalytic converter, through a resonator, if applicable and into the exhaust muffler where exhaust noise is lessened.

In order to secure the exhaust pipe to the exhaust manifold, a flange and seal-joint coupling is utilized. The exhaust system may utilize a slip-joint coupling design with a clamp and a U-bolt or a flange connection with a gasket.

Exhaust hangers and rubber insulators help to support the weight of the exhaust pipe along with insulating any exhaust system vibration, rattle or noise.

Exhaust hangers also space the exhaust system away from the underbody of the vehicle and allows the exhaust system to expand as the exhaust system warms up.

Exhaust heat shields are used to protect the body and other components from damage due to the heat from the exhaust system.

The exhaust system may be comprised of the following components:

- Exhaust manifold
- Exhaust pipes
- Catalytic converters
- Exhaust muffler
- Exhaust resonator, if equipped
- Exhaust tail pipe, if equipped
- Exhaust hangers
- Exhaust heat shields

Resonator

Some exhaust systems are equipped with a resonator. The resonator, located either before or after the muffler, allows the use of mufflers with less back pressure. Resonators are used when vehicle characteristics require specific exhaust tuning.

Catalytic Converter

The catalytic converter is an emission control device added to the engine exhaust system in order to reduce hydrocarbons (HC), carbon monoxide (CO) and oxides of nitrogen (NOx) pollutants from the exhaust gas.

The catalytic converter is comprised of a ceramic monolith substrate, supported in insulation and housed within a sheet metal shell. The substrate may be washcoated with 3 noble metals:

- Platinum (Pt)

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- Palladium (Pd)
- Rhodium (Rh)

The catalyst in the converter is not serviceable.

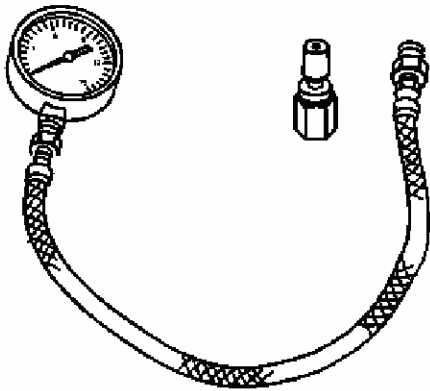
Muffler

The exhaust muffler reduces the noise levels of the engine exhaust by the use of tuning tubes. The tuning tubes create channels inside the exhaust muffler that lower the sound levels created by the combustion of the engine.

SPECIAL TOOLS AND EQUIPMENT

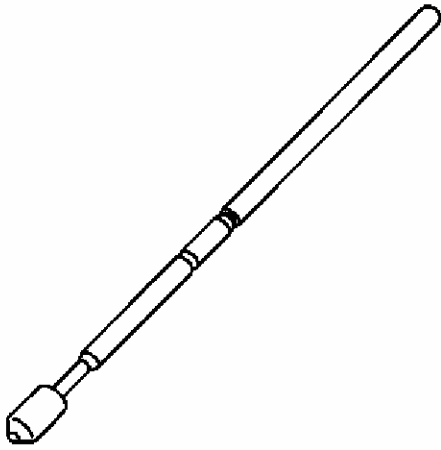
SPECIAL TOOLS

Special Tools

Illustration	Tool Number/Description
	J 35314-A Exhaust Back Pressure Gage
	J 42640 Steering Column Anti-rotation Pin

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